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NATIONAL DAM INSPECTION PROGRAM. SOIL CONSERVATION SERVICE DAM --ETC(U)
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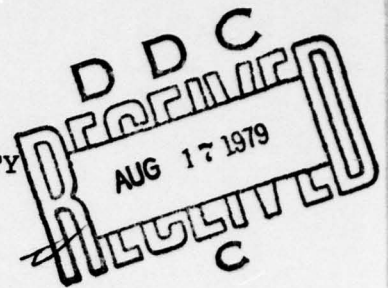
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DELAWARE RIVER BASIN

GOOSE POND RUN, MONROE COUNTY
PENNSYLVANIA

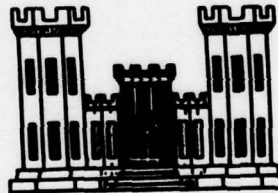
SOIL CONSERVATION SERVICE
DAM PA-464

NDS I.D. NO. PA 00812
DER I.D. NO. 45-247



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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.
Soil Conservation Service DAM PA-464.
(Goose Pond Run Dam). NDS ID PA-00812.
DER ID 45-247. Delaware River Basin,
Goose Pond Run, Monroe County,
Pennsylvania. Phase I Inspection Report.



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DACW31-79-C-0017

Prepared by:

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Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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MARCH 1979

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PREFACE

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This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: SCS Dam PA 464
County Located: Monroe County
State Located: Pennsylvania
Stream: Goose Pond Run
Coordinates: Latitude 41° 12.4'
Longitude 75° 14.3'
Date of Inspection: 17 October 1978

SCS Dam PA 464 is owned by the Monroe County Commissioners and maintained by the County. The dam and reservoir are used as a flood control structure for the downstream town of Canadensis, Pennsylvania. The impoundment was designed by the United States Department of Agriculture, Soil Conservation Service (SCS) in 1971, and the structure was officially completed in 1975.

The dam and its appurtenant facilities are considered to be in good condition and well maintained. The dam is classified as an "Intermediate" size dam with a "High" hazard classification consistent with its potential in the event of failure for extensive property damage and loss of life in Canadensis.

Calculations indicate that the existing spillway systems are capable of passing the Probable Maximum Flood without overtopping. Therefore, the spillway system is considered to be "Adequate".

The visual inspection and review of available documentation indicates that the dam, foundation and its appurtenant structures are in good condition, and the embankment materials were placed in accordance with specification requirements. It was noted that the pond drain gate was jammed in the open position allowing all sediment storage water to drain from the reservoir. In addition, piles of debris were noted in the lower reaches of the reservoir, which could possibly clog the principal spillway inlet system.

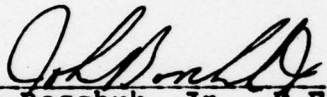
Considering the overall good condition of the dam, the following recommendations are presented and should be performed during annual maintenance of the structure.

1. The jammed pond drain gate should be repaired.

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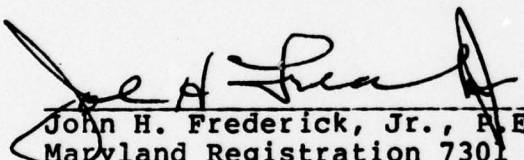
2. Debris along the sides of the reservoir should be cleared to minimize the potential for clogging the principal spillway intake system.

Because of the location of the dam upstream of Canadensis, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents of the possibility of flooding. The Owner should also develop an operational and maintenance procedure to be used to insure that the dam is maintained in the best possible condition. The primary elements of the operational maintenance procedure can be obtained from the checklists completed by the Soil Conservation Service during their annual inspection.



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Woodward-Clyde Consultants

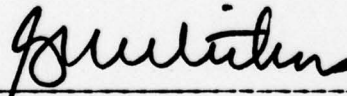
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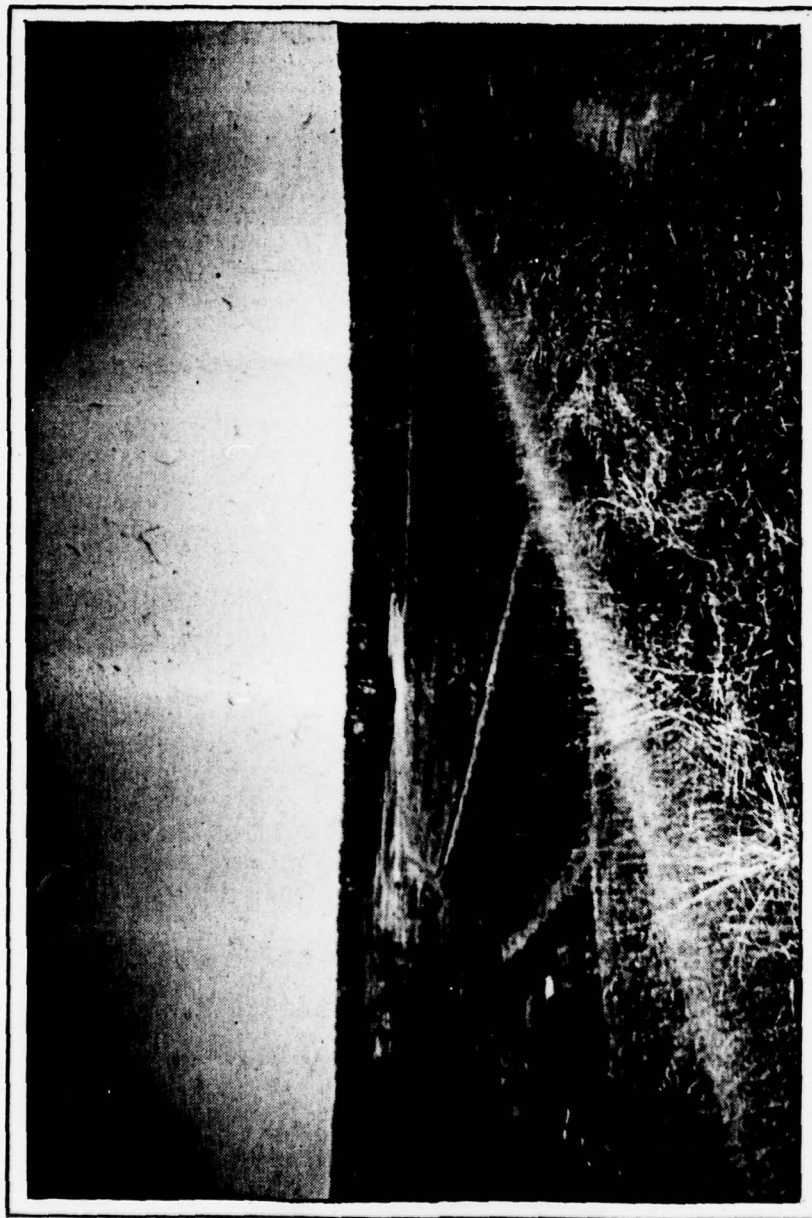
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APPROVED BY:



G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

28 Mar 79
Date



OVERVIEW
SCS DAM PA 464, MONROE COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
SCS DAM PA 464
NATIONAL ID #PA 00812
DER #45-247

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

Soil Conservation Service

a. Dam and Appurtenances. SCS Dam PA 464 is a zoned earth embankment with a downstream drainage blanket and drainage trench ~~as shown on Plate 3~~. The dam length is approximately 1,300 feet and the height measured from the stream bed to the crest is 97 feet. Borrow materials from the emergency spillway excavation and the borrow area ~~(shown on Plate 2)~~ were used to construct the embankment. The dam contains an interior zone (Zone 1) which is reportedly composed of materials classified as clayey sands and silty sands. Zone 1 is encompassed by Zone 2 material classified as silty gravel. The downstream section of the embankment as well as a small portion of the upstream section, contains a pervious Zone 3 material classified as oversized material raked from Zone 1 and Zone 2. ~~A typical embankment section is shown on Plate 3.~~ The upstream and downstream embankment slopes are 2.5H:1V and protected with Crownvetch. The upstream slope contains three berms at elevations 1,169, 1,137 and 1,129, respectively. The downstream slope contains berms at elevations 1,185 and 1,145, respectively. The crest width is 14 feet at design settled fill elevation of 1,204.1. The embankment contains a centerline cutoff trench with a maximum bottom width of 20 feet and 2H:1V side slopes. ← ABSTRACT

Embankment drainage is controlled by a blanket drain located as shown on Plate 4. The embankment drain also

contains a trench drain located 180 feet downstream from the centerline. Water is collected in perforated pipes and discharges into the impact basin.

Water is normally discharged through the principal spillway. A drop inlet riser is located within the upstream toe of the embankment at approximately Station 21 + 85, as shown on Plate 2. Water overflows the riser weirs at elevation 1,128.5 and discharges through a 30-inch diameter reinforced concrete pipe. The pipe discharges at the downstream toe and has an invert elevation of 1,098.0. The riser also contains a pond drain gate at elevation 1,105.5 which discharges through the 30-inch reinforced concrete pipe to an impact basin. The sluice gate is 18 inches in diameter and is manufactured by the Armco Manufacturing Company. The concrete discharge pipe is located at the base of the dam and is founded on natural ground; foundation conditions dictated an "S" shaped alignment. It is approximately 488 feet long and has 15 anti-seepage collars. The pond drain pipe is about 48 feet long with one anti-seep collar.

During severe storms, excess water can be discharged over the emergency spillway at the left abutment. The grass-lined emergency spillway is approximately 175 feet wide with a 30 foot long level control section at elevation 1,196. The channel discharges into the downstream valley, meeting the principal spillway discharge channel approximately 300 feet downstream of the impact basin.

b. Location. The dam is located on Goose Pond Run approximately $1\frac{1}{4}$ miles north of the town of Canadensis, Pennsylvania. The dam, reservoir and drainage basin are located in Barrett Township, Monroe County, Pennsylvania, immediately downstream of a small, old existing dam on the east side of Route 390 between Skytop and Canadensis. There are more than 100 homes in Canadensis, and many would be subject to damage if the dam failed. There are also three dams with reservoirs located upstream of the dam. The dam site and reservoir are shown on USGS Quadrangle entitled "Skytop, Pennsylvania" at coordinates N 41° 12.4' W 75° 14.3'. A regional location plan of SCS Dam PA 464 is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size dam by virtue of its 97-foot height and 2,487 acre-foot total storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and possible loss of life in the downstream town of Canadensis.

e. Ownership. The dam is owned by the Monroe County Commissioners. However, the Civil Defense Authority for the County is responsible for routine inspections and surveillance of the structure during storms. All correspondence should be sent to Mr. Joel Keller, Civil Defense Director, Civil Defense Office, c/o The Court House, Stroudsburg, Pennsylvania 18360.

f. Purpose of Dam. The purpose of this dam is for flood control. It was designed in conjunction with three other dams in the Brodhead Creek watershed, two of which have been built.

g. Design and Construction History. SCS Dam PA 464 was constructed as a flood retarding structure under the provisions of the Watershed Protection and Flood Prevention Act, PL 566. Funding for the project was obtained through the Soil Conservation Service (SCS) who designed the structure and provided resident engineering and inspection services throughout construction. The dam was constructed by the Triple V Construction Company. The application to construct this flood retention structure was submitted on 2 September 1971 and the "Report Upon the Application of the Commissioners of Monroe County" was issued on 4 November 1971. The permit to construct this dam was issued by the Department of Environmental Resources (DER) on 12 November 1971. Construction began during the summer of 1972, but fill placement was delayed until the summer of 1973. On 1 and 2 August 1973, 4.67 inches of rain fell in 18 hours producing runoff which overtopped the 11 foot high embankment, resulting in minimal damage to the fill. Throughout the course of construction there were several problems associated with rain, soil erosion and wet conditions which delayed the fill work. The embankment was finally completed in September 1974. A total of 560,000 yards of earth works were placed in this embankment. The final inspection of the dam by the local sponsors, Monroe County Commissioners, was held on 4 September 1975.

The Resident Engineer for the SCS was Mr. Peter Petras, and one of the principal inspectors associated with the work was Mr. William Weyman.

Construction progress reports prepared by Mr. Petras covering the course of the construction were submitted to the State. The documents indicated that all the materials were placed in accordance with specification requirements. Specifically, all in-place density tests met or exceeded the minimum specification requirements for the compacted fill of at least 98 percent of the Standard Proctor as defined by ASTM 698. Results of the concrete cylinder breaks located in DER files indicated that all the concrete met the specification

requirements of 4,000 psi in 28 days. Complete construction records are also located in SCS files.

h. Normal Operating Procedures. Reservoir outflow is controlled by the principal and emergency spillways. Under normal conditions, water flows over the intake riser weirs, through a 30-inch diameter reinforced concrete pipe located at the base of the embankment, and discharges into an impact basin at the downstream toe. The outlet invert of the pipe and the end sill of the impact basin are at elevation 1,098.0. There are no minimum discharge requirements for this structure.

Excess water is stored up to elevation 1,196. Thereafter, water is discharged through the emergency spillway located at the left abutment.

The reservoir is designed to be lowered or drained by opening the 18-inch sluice gate from the top of the riser to allow water to discharge into the 30-inch concrete pipe.

1.3 Pertinent Data.

A summary of pertinent data for SCS Dam PA 464 is presented as follows:

a.	Drainage Area (sq miles)	6.8
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood at Dam	Unknown
	Principal Spillway (water at emergency spillway crest)	160
	Combined Discharge at Maximum Pool (elev 1,204.1)	12,667
c.	Elevation (feet above MSL)	
	Top of Dam (design after settlement)	1,204.1
	Design High Water	1,197.4
	Emergency Spillway Crest	1,196.0
	Normal Pool	1,128.5
	Principal Riser	
	Lower (pond drain)	1,105.5
	Upper	1,128.5
	Exit Invert of Principal Spillway	1,098.0
d.	Reservoir (feet)	
	Length at Normal Pool (not including Annunziata Dam)	430

	Length at Design High Water (elev 1,197.4)	2,850
e.	Storage (acre-feet)	
	Normal Pool (elev 1,128.5)	23
	Crest of Emergency Spillway	1,860
	At Top of Dam	2,460
f.	Reservoir Surface (acres)	
	Normal Pool	3.6
	Design High Water	68
g.	Dam Data	
	Type	Zoned earth fill.
	Length	1,310 ft
	Height Above Streambed	97 ft
	Crest Width	14 ft
	Volume	560,000 cu yd
	Side Slopes	
	Upstream	2.5H:1V
	Downstream	2.5H:1V
	Berms	
	Upstream Slope Has 3 Berms	
	Width at Elev 1,028.0	14 ft
	Width at Elev 1,137.0	10 ft
	Width at Elev 1,169.0	10 ft
	Downstream Slope Has 2 Berms	
	Width at Elev 1,145.0	10 ft
	Width at Elev 1,185.0	10 ft
	Cutoff	Bottom width varies from 12 ft to 20 ft, max de- sign depth at elev 1,075 ft.
	Grout Curtain	None
h.	Spillway	
	Principal Type	Drop inlet riser, conduit and im- pact basin.
	Emergency Type	Trapezoidal chan- nel cut through rock.
	Width at Control Section	175 ft

SECTION 2 ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of engineering data on SCS Dam PA 464 is attached as Appendix A. Engineering data available for review is contained in a 34-page set of drawings provided by the United States Department of Agriculture, Soil Conservation Service (SCS). In addition, other data included the "Report Upon the Application of the Commissioners of Monroe County", submitted by Mr. Joseph J. Ellam, Chief Dam Section of the Department of Environmental Resources, as well as other miscellaneous letters, correspondence and monthly construction reports prepared by the SCS Resident Engineer. Also, the available design and construction documentation located in the SCS archives, Mechanicsburg, Pennsylvania, were reviewed for this investigation.

b. Design Features. The principal design features of SCS Dam PA 464 are illustrated on the plans and profiles enclosed in Appendix E as Plates 2 through 7. These plates were reproduced from SCS drawings. A detailed description of the design features is also described in Section 1.2, paragraph a, and the pertinent data relative to the structure is presented in Section 1.3.

In summary, the relatively symmetrical embankment with a 14 foot wide crest and 2.5H:1V upstream and downstream slopes contains a central zone of relatively impervious material (Zone 1) with an outer Zone 2 of less impervious material, and an upstream toe and downstream toe of relatively pervious rock (Zone 3). The embankment contains a downstream blanket drain and drainage trench which collects and discharges water into the impact basin. A cutoff trench of Zone 1 materials is beneath the centerline of the structure.

The principal spillway consists of a drop inlet transition riser connected to a 30-inch diameter reinforced concrete pipe to a standard SCS impact basin at the downstream toe. The reservoir is drained by an 18-inch drain which discharges through the 30-inch pipe.

The grass-lined emergency spillway is located at the left abutment and contains a 30 foot long level control section across its 175-foot width. The side slopes are 2.5H:1V on the left side, and 3H:1V on the right side. Water from the principal spillway discharges to a rock lined channel

and emergency spillway water flows through a cleared area and converges with the principal spillway channel approximately 300 feet downstream from the toe.

2.2 Construction.

Details of construction are presented in Section 1.2, paragraph g. All construction records were made available for review for this inspection by the SCS State office in Harrisburg, Pennsylvania.

2.3 Operation Data.

There are no operational records maintained. There are no minimum flow requirements for the downstream channel. There are no water level measurements or rainfall records maintained within this watershed.

2.4 Evaluation.

a. Availability. All engineering data evaluated and reproduced for this report was provided by either the Pennsylvania Department of Environmental Resources (DER) or the SCS and supplemented by conversations with representatives of the Civil Defense Authority for Monroe County.

c. Validity. There is no reason to question the validity of this data.

SECTION 3 VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B, and are summarized and evaluated as follows. In general, the dam and its appurtenant facilities are in good condition and well maintained. Monroe County maintenance employees periodically inspect and maintain this structure. At the time of the inspection, the normal stream flow was discharging through the pond drain. Water was flowing over the dam spillway located in the sediment pool about 400 feet upstream of the dam.

b. Dam. During the visual inspection, there were no indications of distortions in alignment or grade that would be indicative of movement of the embankment or the foundation. Inspection of the downstream slope and adjacent downstream area disclosed no seepage flow. As no water was impounded at the time of the inspection, hillside seeps into the reservoir area were observed. These seeps are common to the area and do not affect the stability of the embankment.

There were no indications of surface cracks, unusual distortions at or beyond the toe, or significant sloughing or erosion of the embankment or abutment slopes. The downstream slope and the upstream slope above the sediment pool are Crownvetch covered, and the vegetation was considered to be in good condition. A few inches of sediment line the sediment pool.

The upstream and downstream berms drain away from the embankment, with gradient parallel to the embankment. No evidence of ponding or potential for ponding of runoff on the berms was noted.

The blanket drain discharge pipes outlet through the walls of the impact basin. Discharge from these pipes was estimated to be approximately 7 to 10 gallons per minute for the right pipe, and less than $\frac{1}{2}$ gallon per minute for the left pipe. The water emerging from these pipes was observed to be clear with no signs of turbidity or deposits of silt at the base of the pipe.

c. Appurtenant Structures.

1. Intake Riser. As shown on Photograph 1, the riser is located within the upstream embankment, and water flows over weirs at the top of the riser or through the pond drain at the riser base, shown on Photograph 2. The exposed portions of both intakes were carefully inspected and evaluated to be in good condition with no signs of concrete deterioration, spalling or other structural deficiencies. Similarly, the impact basin at the downstream toe was also inspected and observed to be in equally good condition, with no signs of distress, deterioration or other structural deficiencies. The interior of the intake riser could not be inspected in that it was not readily accessible.

The riprap-lined control channel was also inspected and observed to be stable with no significant signs of scouring or channel deterioration. As water was passing through the discharge conduit, access to the conduit was impossible and the conduit could not be inspected.

It is noted that the pond drain was open due to a malfunctioning gate allowing for no sedimentation storage.

2. Emergency Spillway. The grass-lined emergency spillway at the left abutment was inspected and found to be quite stable and in good condition. Side slopes are well vegetated and appear to be well maintained. The emergency spillway entrance and exit channels and control section are considered to be in good condition.

d. Reservoir. At the time of inspection, the pond drain was open because of a malfunctioning gate, eliminating all storage behind the dam. However, the pond created by the older dam retains a small quantity of water. This dam is considered to be in poor condition. However, if this dam failed at any time, it would have no significant impact on the structural integrity of the dam or its intake system. Reconnaissance of the remaining portion of the reservoir disclosed no evidence of significant siltation, slope instability, or other features that would significantly affect the flood storage capacity of the reservoir.

e. Downstream Channel. As shown on Plate 1, Appendix E, Goose Pond Run discharges into Brodhead Creek near the town of Canadensis, Pennsylvania. However, prior to this junction, Goose Pond Run flows approximately parallel to Route 390, crossing 390 northwest of Canadensis, Pennsylvania. There are several dozen summer homes and year-round homes, as well as minor ponds created by small dams within the property areas of

the residents. In the event of failure of the dam during a period of significant retention, extensive property damage and possible loss of life is likely along Goose Pond Run.

3.2 Evaluation.

The inspection of the dam and appurtenant facilities disclosed no evidence of apparent past or present movement that would indicate existing instability of the dam, principal or emergency spillways. The interior portions of the principal spillway intake riser and discharge pipe could not be inspected due to flow through the system. The discharge channel of the principal spillway was inspected and found to be in good condition, but the sluice gate was damaged.

Similarly, the emergency spillway discharge channel and area downstream were also observed to be in good condition. It is noted that water has never flowed through this spillway.

There is very little debris noted along the reservoir shoreline or along the slopes of the drainage area. However, debris had been collected and piled on the embankment near the riser. All of the drainage area is considered to be well vegetated and stable.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures.

Operational procedures are discussed in some detail in Section 1.2. The operation of the dam does not require a dam tender. Under normal conditions, flow discharges over the weirs of the principal spillway. However, due to a malfunctioning valve at the time of inspection, water was draining through the pond drain, eliminating all storage immediately behind the dam. Both the principal spillway and pond drain intakes discharge water through a common 30-inch ID concrete pipe into a standard SCS impact basin. Excess water can be stored until it reaches the crest of the emergency spillway. As reported by the Owner's representatives, water has never flowed over the emergency spillway.

There are no written operational or maintenance procedures other than the general maintenance inspection checklist provided by the Soil Conservation Service (SCS) during their annual inspections.

4.2 Maintenance of the Dam.

The dam is maintained by a Monroe County maintenance staff, who periodically check the embankment, mow the grass and remove woody vegetation.

4.3 Maintenance of Operating Facilities.

Maintenance of these facilities includes cleaning the debris from the intake systems and checking the structural integrity of the system during the periodic cleaning process.

4.4 Warning Systems In Effect.

The local Civil Defense Authority, representing the Monroe County Commissioners, reported that there are no formal warning systems or procedures established to be followed during periods of heavy rainfall. However, if a hazardous condition is found, the Civil Defense Authority would notify downstream residents of the potential of impending hazardous conditions.

4.5 Evaluation.

It is judged that the current operating procedure, which does not require a dam tender, is a realistic means of operating the relatively simple control facilities at SCS Dam PA 464.

Since there are no formal warning procedures, it is concluded that a procedure should be developed so that downstream residents may be amply warned of possibly high flows or potentially hazardous conditions. A maintenance procedure, which includes an inspection checklist, should be formalized and implemented by the Civil Defense Authority. The contents of this maintenance and inspection checklist can be derived from the yearly checklist the SCS completes during their annual inspections.

SECTION 5 HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The complete folder of design calculations was reviewed at the Soil Conservation Service (SCS) State office in Harrisburg, Pennsylvania. Portions of the design folder are presented in Appendix C.

The total watershed is small, approximately 4.5 miles long and 1.9 miles wide, having a total area of approximately 6.8 square miles. About 65 percent of the watershed is controlled by upstream structures. Approximately 1.3 miles above the dam, two tributaries of Goose Pond Run form. The tributary to the west drains several swampy areas and Oak Spring Dam. The tributary to the east drains Ransberry Pond Dam at Camp Canadensis.

The first significant dam upstream is approximately 2.4 miles above PA Dam 464 and is owned by the Oaks Spring Club. The surface area of this reservoir is about 30 acres within a drainage area of about 0.6 square miles. It is estimated that the volume of water of this reservoir is about 200 acre-feet. The second significant dam, known as Ransberry Pond Dam or Lake Lenape Dam, has a surface area of about 36 acres, a reported volume of about 525 acre-feet, and a 3.8 square mile drainage area. About 2.8 miles above Ransberry Pond is Goose Pond, which is principally a swamp that was shown as Salus Lake on old USGS Quadrangle maps.

Immediately upstream of SCS PA 464 is Annunziata Dam which is a 14 foot high masonry structure located about 400 feet upstream. This structure is not considered significant since it is within the sediment pool of SCS PA 464 and failure would not affect the performance of SCS Dam 464. The spillway crest of Annunziata Dam is about the same elevation as the top of the principal spillway riser of SCS PA 464. Elevations within the drainage basin range from a high of 1,650 feet to 1,128.5 at normal pool elevation of SCS PA 464. The watershed is almost 100 percent wooded with almost no residential development. It is not expected that runoff characteristics would change significantly in the near future.

In accordance with the criteria established by the Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard potential classification is the Probable Maximum Flood (PMF). The Soil Conservation Service designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the PMF.

b. Experience Data. There are no records of reservoir water levels or rainfall measurements within this watershed. There are no estimates or records of previous high water levels.

c. Visual Observations. On the date of the inspection, the only conditions observed that would indicate a possible reduction in principal spillway capacity are piles of debris that apparently had been removed from the reservoir area, but not removed from the flood water area. The possibility exists that the debris could lodge in the principal spillway trash racks and reduce the flow capabilities of the principal spillway system. While this is not a dangerous condition, it is considered to be an undesirable condition. Observations regarding the condition of the downstream channel, spillways and reservoir are located in Appendix B and discussed in greater detail in Section 3.

d. Overtopping Potential. The dam was designed to pass the PMF without overtopping even if the upstream dam failed. The PMF inflow hydrograph and flood routing are presented in Appendix C. This information was reviewed, evaluated and judged to be adequate and correct.

e. Spillway Adequacy. The peak inflow was computed as 12,950 cfs resulting from a 6-hour storm with 25.5 inches of rainfall, producing 21.5 inches of runoff. The storm was routed through the reservoir to produce a peak discharge of 12,667 cfs and maximum water level (elevation 1,204.1 feet) at the top of the dam. Spillway systems for this dam are considered to be "Adequate" as the dam will pass the PMF without overtopping.

f. Downstream Conditions. Goose Pond Run enters Brodhead Creek about 1.6 miles below the dam. Several dozen homes or businesses are built in the flood plain along Goose Pond Run and/or along Brodhead Creek.

SCS Dam PA 464 was designed as part of a total flood water control plan for the Brodhead Creek Watershed. The objective of the watershed plan is to protect resorts along Brodhead and its tributaries, and to protect the residents in Canadensis, Pennsylvania. The need for the dam was determined after the flood of August 18, 1955 as a result of 7.3 inches of rain in 8 hours. This resulted in direct damage costs in excess of \$1,115,000.00, and the loss of 9 lives within the watershed.

Damage, including loss of life, would be significantly greater if the dam failed during the passing of the PMF than damage resulting from high flows if the dam did not fail during the PMF.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. The visual observations detected no evidence of existing or pending embankment instability. The upstream and downstream slopes were stable, in quite good condition and well vegetated. There were no exterior signs or other evidence to indicate that the internal drainage systems were not operating properly.

No signs of seepage were observed at the downstream toe or in areas adjacent to the toe. However, some sidehill seepage was noted upstream from the dam, but this condition is typical for the drainage basin and not assessed to have any affect on the stability of the structure. As discussed in Section 3.1, the functioning of the drainage system was not inspected under a high reservoir level.

Exposed portions of the principal spillway were inspected and judged to be in good condition. It is pertinent to note that transition risers of this design have had cracking develop in the transition section at the downstream face. Although such cracking has occurred in risers under much higher embankment loads, this riser has been inspected by Soil Conservation Service (SCS) personnel, and reportedly no evidence of cracking was observed. However, the possibility of cracking should not be discounted.

The grass-lined emergency spillway was assessed to be in good condition with no signs of sloughing, erosion or structural deterioration.

b. Design and Construction Data. Structural design (reinforced concrete) documentation is in SCS files. In addition, a combined soils and geology report prepared by Mr. Charles H. McElroy of the SCS Soil Mechanics Laboratory was reviewed. This report describes such items as the condition of the foundation materials based on analysis of the boring logs and permeability tests. The report also contained a discussion of the embankment materials to include permeability, shear strength and settlement characteristics, as well as a short paragraph indicating that a slope stability analysis was performed using the modified Swedish circle procedure. Factors of safety, under different conditions, ranged from 1.29 to 1.99, the minimum value occurring during rapid drawdown conditions. According to Corps of Engineers criteria, EM 1110-2-1902, these values are acceptable.

Documents pertaining to the design also included a 34-sheet set of drawings prepared by the SCS and a complete set of hydrologic/hydraulic calculations. Principal design features of this structure were extracted from these drawings and are located in Appendix E of this report.

Progress reports prepared by the SCS Resident Engineer and inspection reports prepared by Department of Environmental Resources representatives indicated that all work was performed in accordance with SCS requirements and that out of the 74 compaction tests performed, all tests exceeded the minimum specification requirement of 98 percent of the Standard Proctor. Concrete test cylinders for the principal spillway were taken and the results indicate that all test breaks exceeded the 4,000 psi strength requirement. A check of the spillway dimensions was performed along with a check of the embankment slopes. The results indicated that these features were constructed in general accordance with the drawings.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. There are no reports nor is there any evidence that modifications were made to this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. As the stability analysis resulted in a minimum factor of safety of 1.29 under rapid drawdown conditions, the most critical loading conditions, it can be assumed that the seismic stability requirements are satisfied.

SECTION 7 ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. The visual inspection and review of the design and construction documentation indicates that the dam, foundation and appurtenant structures of SCS Dam PA 464 are in good condition. The hydrologic and hydraulic computations presented in Appendix C indicates that the structure will pass the Probable Maximum Flood without overtopping. Therefore, the spillway systems of this structure are considered to be "Adequate". In the event that high flows are passed through the emergency spillway, property damage is still likely to occur along Goose Pond Run between the dam and the town of Canadensis, since the flood plain along the creek is narrow and contains many homes. In the event the dam fails while retaining a significant quantity of water, extreme property damage and possible loss of life would be expected.

b. Adequacy of Information. The information available for this investigation was sufficiently adequate to evaluate the structures and hydrologic aspects of the basin.

c. Urgency. It is recommended that the suggestions presented in Section 7.2 be implemented during routine maintenance of the structure.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be undertaken.

1. The jammed pond drain valve should be repaired.
2. Debris along the sides of the reservoir should be cleared to some reasonable degree to minimize the potential for clogging the principal spillway intake system.

b. Operation and Maintenance Procedures. Because of the location upstream from the highly populated area of Canadensis, Pennsylvania, a formal procedure of observation and warning during periods of high precipitation and subsequent runoff should be developed and implemented. This procedure should include a method of warning downstream residents that potentially dangerous high flows could occur downstream. The Owner should also develop an operational and maintenance procedure to be used to insure that the dam is maintained in the best possible condition. The components of this procedure can be obtained from the Soil Conservation Service.

APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM SCS Dam PA 464

ID # PA 00812

Sheet 1 of 4

ITEM

REMARKS

AS-BUILT DRAWINGS

Located in SCS files.

REGIONAL VICINITY MAP

See Plate 1, Appendix E.

CONSTRUCTION HISTORY

Located in SCS files. Photographs and progress reports in DER files.

TYPICAL SECTIONS OF DAM

See Appendix E.

OUTLETS - PLAIN

DETAILS

See Appendix E.

CONSTRAINTS

DISCHARGE RATINGS

Located in SCS files, also see Appendix C.

RAINFALL/RESERVOIR RECORDS

None

ITEM	REMARKS
DESIGN REPORTS	<i>Located in SCS files</i>
GEOLOGY REPORTS	<i>Located in SCS files.</i>
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	<i>Located in SCS files.</i>
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	<i>Complete records in SCS files. Boring records also on design drawings located in DER files.</i>
POST-CONSTRUCTION SURVEYS OF DAM	<i>None</i>
BORROW SOURCES	<i>See Plate 8, Appendix E.</i>

ITEM	REMARKS
MONITORING SYSTEMS	<i>None</i>
MODIFICATIONS	<i>None</i>
HIGH POOL RECORDS	<i>None</i>
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	<i>None</i>
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	<i>None known</i>
MAINTENANCE OPERATION RECORDS	<i>None</i>

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	See Appendix E.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	See Appendix E.
MISCELLANEOUS	<ol style="list-style-type: none"> 1. SCS 1977 Inspection Report 2. "Report Upon the Application of Commissioners of Monroe County" dated 4 November 1971 3. "Permit" issued 12 November 1971

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

(SCS PA 464)
Name Dam Goose Pond Run Dam County Monroe State Pennsylvania National ID # PA 00812
Type of Dam Earth Hazard Category I (High)
Date(s) Inspection 17 Oct. 1978 Weather Clear and Cool Temperature 40's

Pool Elevation at Time of Inspection N/A M.S.L. * Tailwater at Time of Inspection N/A M.S.L. *
* Dry reservoir; used for flood control.

Inspection Personnel:

Mary Beck (Geologist) Vince McKeever (Hydrologist) John H. Frederick (Geotechnical) 23 October 1978
John Boschuk, Jr. (Civil) Raymond Lambert (Geologist)
John Boschuk, Jr. Recorder

Remarks:

Mr. Cliff Dennis, County Engineer (Edward Hess and Associates) and Mr. Lowell Edminster SCS, were on site and provided assistance to the inspection team.

CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

ANY NOTICEABLE SEEPAGE	N/A	
------------------------	-----	--

STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
--	-----	--

DRAINS	N/A	
--------	-----	--

WATER PASSAGES	N/A	
----------------	-----	--

FOUNDATION	N/A	
------------	-----	--

CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

Sheet 4 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed, however, the benches appear to be graded away from the embankment instead of toward the embankment as is usual for SCS designed dams. Lateral drainage was not readily observed and water may pond on the benches. This should be checked after a significant rainfall.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No unusual movements or distortions were observed.	
RIPRAP FAILURES	None observed.	

EMBANKMENT

Sheet 5 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

JUNCTION OF EMBANKMENT
AND ABUTMENT, SPILLWAY
AND DAM

No unusual distortions, movements or misalignments were observed.

ANY NOTICEABLE SEEPAGE

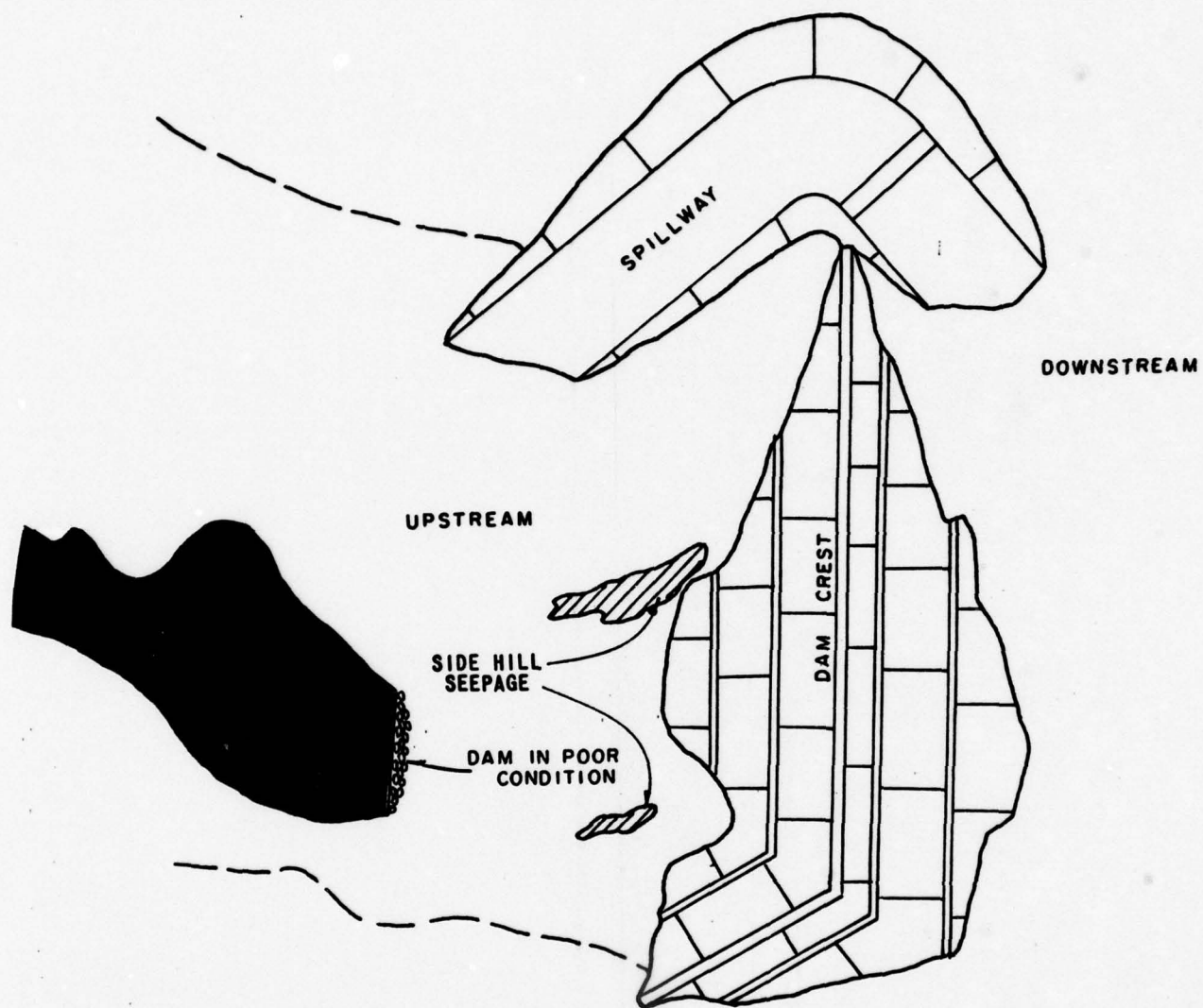
None observed.

STAFF GAGE AND RECORDER

None

DRAINS

All appeared to be functioning. Within the impact basin, the right drain was discharging at an estimated rated of 7-10 gpm. and the left drain at less than 0.5 gpm.



SEEPAGE LOCATION PLAN
SHEET 5A OF 11

OUTLET WORKS

(PRINCIPAL SPILLWAY)

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	No cracking, spalling or significant deterioration was observed.	
INTAKE STRUCTURE	Structure observed to be in good condition.	
OUTLET STRUCTURE	Structure observed to be in good condition.	
OUTLET CHANNEL	The channel was observed to be in good condition.	
EMERGENCY GATE	The pond drain valve at the top of intake structure was reported by Mr. Edminster, SCS, to be inoperable.	

UNGATED SPILLWAY

(EMERGENCY SPILLWAY)

Sheet 7 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

CONCRETE WEIR	Grass lined channel. The control section of the spillway was observed to be in good condition.	
---------------	--	--

APPROACH CHANNEL	Observed to be in good condition.	
------------------	-----------------------------------	--

DISCHARGE CHANNEL	Observed to be in good condition.	
-------------------	-----------------------------------	--

BRIDGE AND PIERS	None.	
------------------	-------	--

CHANNEL (GENERAL COMMENTS)	There were several marshy areas noted in the channel which are probably attributed to surface runoff.	
----------------------------	---	--

GATED SPILLWAY

Sheet 8 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	None	
APPROACH CHANNEL	None	
DISCHARGE CHANNEL	None	
BRIDGE AND PIERS	None	
GATES AND OPERATION EQUIPMENT	None	

INSTRUMENTATION

Sheet 9 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION

MONUMENTATION/SURVEYS

None

OBSERVATION WELLS

None

WEIRS

None

PIEZOMETERS

None

OTHER

None

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SLOPES	The reservoir side slopes are moderate to steep and generally wooded. There is considerable debris, including fallen trees, that could block the principal spillway. There are two piles of debris near the riser that appear to have been cleaned from the riser. This debris should be removed or burned to insure that it cannot block the riser inlet again.	
--------	--	--

SEDIMENTATION	The sediment pool is exposed (as the pond drain cannot be closed) and there is approximately one inch of sediment in the sediment pool. The old dam located within the reservoir area appears to be more than half full of sediment. An allowance was made for sediment storage in the design of 464 and, therefore, sedimentation has not reduced available flood water storage.	
---------------	---	--

RESERVOIR	An old 14 foot high masonry dam, DER No. 45-164, is in the reservoir. The dam is in poor condition and its failure is considered possible at any time. The spillway crest of the old dam is approximately the same elevation as the top of the riser. Failure of the masonry dam before or during a large storm will have no effect on the flood storage capacity of SCS PA 464 dam.	
-----------	--	--

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS; DEBRIS, ETC.)	<i>The downstream channel is in good condition with little or no debris. The flood plain on each side of the channel is wooded with underbrush.</i>	
SLOPES	<i>The valley gradient is about 0.017.</i>	
APPROXIMATE NO. OF HOMES AND POPULATION	<i>The first downstream house is about 2000 feet below the dam. About 4000 feet below the dam are several homes on each side of Goose Pond Run. About 1.4 miles below the dam Goose Pond Run joins with the Brodhead River in the community of Canadensis.</i>	

APPENDIX

C

SCS PA 464
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 95+% wooded, 65 % of watershed controlled by
2 upstream dams, very little residential
development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1128.5 feet (20 Acre-Feet).

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1204.1 ft. (2487 Acre-Feet).

ELEVATION MAXIMUM DESIGN POOL: 1197.4.

ELEVATION TOP DAM: 1204.1 feet.

EMERGENCY SPILLWAY

- a. Elevation 1196.0
- b. Type Trapezoidal channel cut through rock
- c. Width 175 feet.
- d. Length Approximately 1000 feet.
- e. Location Spillover Left abutment.
- f. Number and Type of Gates None.

OUTLET WORKS:

- a. Type Drop inlet riser, conduit and impact basin.
- b. Location Approximately 670 feet from left abutment.
- c. Entrance inverts 1128.5 feet.
- d. Exit inverts 1098.0.
- e. Emergency draindown facilities Pond drain invert at 1105.5.

HYDROMETEOROLOGICAL GAGES:

- a. Type None
- b. Location N/A
- c. Records N/A

MAXIMUM NON-DAMAGING DISCHARGE: ---

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: Jan. 9, 1979
By: HFB
Sheet: 2 of 7

DAM PA 464 Nat. ID No. PA00812 DER No. 45-247

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.	<u>1204.1</u>		
2. Freeboard, ft.			
3. Spillway ⁽¹⁾ Crest Elev., ft.	<u>1128.4</u>		
3a. Secondary ⁽²⁾ Crest Elev., ft.	<u>1196.0</u>		
4. Max. Pool Elev., ft.	<u>1204.1</u>		
5. Max. Outflow ⁽³⁾ , cfs	<u>12,667</u>		
6. Drainage Area, mi ²	<u>7.0</u>		<u>6.8</u>
7. Max Inflow ⁽⁴⁾ , cfs	<u>12950</u>		
8. Reservoir Surf. Area, Acre	<u>36</u>		
9. Flood Storage ⁽⁵⁾ , Ac-Ft			

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

- (1) Main emergency spillway.
- (2) Secondary ungated spillway.
- (3) At maximum pool, with freeboard, ungated spillways only.
- (4) For columns B, C, use PMF.
- (5) Between lowest ungated spillway and maximum pool.

Date: 1/9/79
By: MFB
Sheet: 9 of 7

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from sheet 2)	Source
1A, 3A, 3aA, 4A, 6A	Design drawings dated Aug. 1971
5A, 7A	Flood routing, SCS design folder, July 1968
8A	Calculations, SCS design folder, 6/68
6C	USGS Maps Skytop (1973) Buck Hill Falls (1973) Promised Land (1973) Newfoundland (1973)

SCS PA 464
Hydrology/Hydraulics

Classification (Ref.-Recommended Guidelines for Safety
Inspection of Dams)

1. The hazard potential is rated as HIGH as there would be loss of life if the dam failed.
2. The size classification is INTERMEDIATE based on its 97-foot height and 2487 Ac-Ft total storage capacity.
3. The spillway design flood, based on size and hazard classification, is the Probable Maximum Flood (PMF).

Hydrologic/Hydraulic Analysis

The complete H & H design folder was available for review. The PMF inflow hydrograph was determined according to procedures in the SCS National Engineering Handbook, Section 4. Hydrograph calculations and flood routing were performed by the SCS computer program, TR-20. Portions of the original design folder are included in this Appendix.

The design inflow hydrograph neglects the presence of the two upstream dams. The watershed is described in detail in Section 5 of the text and shown on Plate 1, Appendix E. Ransberry Pond Dam is at the site of a preexisting pond, and if it failed, would release relatively little flood water. The effect of the dam was considered in calculations for the time of concentration for the watershed but the effects of failure of the dam are negligible and may be conservatively ignored. Oak Spring Club Dam, although constructed about 1957, does not have a DER number and does not appear on USGS Maps available at the time PA 464 was designed. The volume of water released by failure of Oak Spring Club Dam during an extreme event is estimated to be less than 200 Ac-Ft, or less than 10% of the total capacity of 464 dam, and is estimated to have little effect on 464 dam.

CHECKED *JSJ* 12/79

Original design parameters were checked against current information and/or criteria. The drainage area from current USGS Maps is 6.8 square miles, somewhat less than the 7.0 square miles used in design.

Calculations for the inflow hydrograph were based on a 6-hour rainfall of 25.5 inches. Rainfall criteria established for this investigation by the Corps of Engineers, included the use of the Hop Brook factor, a point rainfall reduction factor. For a watershed of this size, the point rainfall is reduced by 20%, or to 20.4 inches.

Based on review of the design folder and the above evaluation of design assumptions and data input, the original PMF flood routing is judged adequate.

CHECKED *JG* 1/2/79

State <u>PENNSYLVANIA</u>		Project <u>BRODHEAD CREEK</u>		SHEET <u>5 of 7</u>	
By <u>R.A.S.</u>	Date <u>6-17-68</u>	Checked By	Date	Job No <u>PA-464</u>	
Subject <u>WORK PLAN - DESIGN COMPARISON</u>				Sheet <u>H-2 of</u>	

ITEM	UNIT	WORK PLAN	DESIGN	COMMENTS
<u>DRAINAGE AREA</u>	SQ MI.	<u>7.0</u>	<u>7.0</u>	
<u>STORAGE CAPACITY</u>				
SEDIMENT (INC AERATED)	AC.FT.	<u>105</u>	<u>32.3</u> <u>32.3</u>	
BENEFICIAL	AC.FT.			
RETARDING	AC.FT.	<u>1800</u>	<u>1800</u>	
TOTAL	AC.FT.	<u>1905</u>	<u>1832.3</u>	
BETWEEN HIGH & LOW S	AC.FT.			
<u>SURFACE AREA</u>				
NORMAL POOL	ACRE	<u>3.0</u>	<u>3.6</u>	
RETARDING POOL	ACRE			
DESIGN HIGH WATER	ACRE			
<u>VOLUME OF FILL</u>	CU.YD	<u>465,960</u>		
<u>TOP OF DAM ELEV.</u>	FEET	<u>186.8</u>	<u>189.6</u> ^{1234.1}	
<u>MAX HEIGHT OF DAM</u>	FEET	<u>93</u>	<u>95.8</u>	
<u>EMERGENCY SPILLWAY</u>				
CREST ELEVATION	FEET	<u>179</u>	<u>181.0</u> ^{1195.5}	
BOTTOM WIDTH	FEET	<u>175</u>	<u>175</u>	
TYPE	-	<u>Rock</u>	<u>Rock</u>	
PERCENT CHANCE OF USE	-	<u>1</u>	<u>41</u>	
AVE. CURVE NO. COND. II	-	<u>73</u>	<u>73</u>	
<u>EM. SP. HYDROGRAPH</u>				
STORM RAINFALL - 6 HR	IN.	<u>12.1</u>	<u>10.0</u>	
STORM RUNOFF	IN.	<u>10.73</u>	<u>6.62</u>	
VELOCITY OF FLOW - V	FPS.	<u>9.1</u>	<u>6.3</u>	
PEAK DISCHARGE RATE	CFS	<u>4,210</u>	<u>1191</u>	
MAX WATER SURFACE EL.	FEET	<u>183.3</u>	<u>182.9</u> ^{1197.4}	
<u>FREEBOARD HYDROGRAPH</u>				
STORM RAINFALL - 6 HR.	IN.	<u>24.3</u>	<u>25.5</u>	
STORM RUNOFF	IN.	<u>20.3</u>	<u>21.54</u>	
VELOCITY OF FLOW - V	FPS	<u>124</u>	<u>17.</u>	
PEAK DISCHARGE RATE	CFS	<u>10,500</u>	<u>12,667</u>	
MAX WATER SURFACE EL.	FEET	<u>186.8</u>	<u>189.6</u> ^{1224.1}	
<u>PRINCIPAL SPILLWAY</u>				
RISER SIZE	FT.			
MAX LOW STAGE FLOW	CFS	<u>200</u>	<u>160</u>	
ORIFICE SIZE	FT.			Reference-
MAX HIGH STAGE FLOW	CFS			SCS design
PIPE SIZE	DIA.		<u>30"</u>	folder
<u>CAPACITY EQUIVALENTS</u>				
TOTAL SEDIMENT VOL.	IN.	<u>0.28</u>	<u>0.086</u>	
RETARDING STORAGE	IN.	<u>4.84</u>	<u>4.82</u>	
EM SPILLWAY STORAGE				
TO TOP OF DAM	IN.	<u>1.35</u>	<u>1.63</u>	
<u>CLASS OF STRUCTURE</u>	-	<u>C</u>	<u>C</u>	
<u>CONSTRUCTION COSTS</u>				

H-116

SHEET 6 of 7

E. S. DESIGN AND FREEBOARD ROUTINGS.

BRODHEAD CREEK PA-464

JULY 1968 HLW

CURVE NO. 73. TC 6.80 STORM DURATION 6.80

EMER. SPW. RAINFALL 10.00 FREEBOARD RAINFALL 25.50

CASE NO. 2. DRAINAGE AREA 7.00 EMER. SPW. CREST 181.0

801 150. L1 200. 802 175. L2 200. 803 200. L3 200.

ELEVATION	STORAGE	CFS	CFS	CFS
114.01	23.	0.	0.	0.
120.00	50.	78.	78.	78.
130.00	128.	88.	88.	88.
140.00	261.	111.	111.	111.
150.00	460.	125.	125.	125.
160.00	767.	136.	136.	136.
170.00	1211.	148.	148.	148.
180.00	1784.	158.	158.	158.
181.00	1823.	160.	160.	160.
182.00	1905.	442.	489.	536.
183.00	1987.	1076.	1229.	1381.
184.00	2069.	1977.	2279.	2582.
185.00	2152.	3133.	3628.	4123.
186.00	2217.	4514.	5239.	5964.
187.00	2283.	6075.	7059.	8044.
188.00	2348.	7801.	9073.	10346.
189.00	2414.	9662.	11244.	12827.
190.00	2480.	11725.	13651.	15577.
190.10	2481.	11932.	13893.	15853.
190.20	2482.	12139.	14134.	16129.

↑ used

Reference-
SCS design
folder

FREEBOARD ROUTING.

SHEET 7 of 7

BRODHEAD CREEK PA-464

JULY 1968 HLW

BO = 175. L = 200.

TIME	INFLOW	AVE IN	OUTFLOW	ELEV.
0.25	5.	2.	0.	114.02
0.50	10.	7.	0.	114.05
0.75	15.	13.	1.	114.11
1.00	21.	18.	2.	114.19
1.25	52.	37.	4.	114.35
1.50	136.	94.	9.	114.76
1.75	220.	178.	19.	115.52
2.00	303.	262.	34.	116.63
2.25	387.	345.	52.	118.04
2.50	679.	533.	78.	120.13
2.75	1071.	875.	80.	122.24
3.00	1463.	1267.	83.	125.38
3.25	1856.	1659.	87.	129.55
3.50	2253.	2054.	94.	132.79
3.75	3063.	2658.	103.	136.76
4.00	3874.	3468.	112.	141.32
4.25	4684.	4279.	118.	145.65
4.50	5495.	5090.	125.	150.52
4.75	6353.	5924.	129.	154.42
5.00	7299.	6826.	134.	158.93
5.25	8245.	7772.	139.	162.81
5.50	9191.	8718.	144.	166.80
5.75	10137.	9664.	148.	170.95
6.00	10805.	10471.	152.	174.67
6.25	11344.	11075.	156.	178.61
6.50	11884.	11614.	755.	182.35
6.75	12424.	12154.	3474.	184.88
7.00	12950.	12687.	7357.	187.14
7.25	12917.	12934.	10099.	188.47
7.50	12884.	12901.	11549.	189.12
7.75	12851.	12867.	12274.	189.42
8.00	12818.	12834.	12582.	189.55
8.25	12655.	12736.	12667.	189.59
8.50	12261.	12458.	12552.	189.54
8.75	11868.	12064.	12284.	189.43
9.00	11474.	11671.	11947.	189.29
9.25	11081.	11278.	11579.	189.13
9.50	10591.	10836.	11176.	188.96
9.75	10060.	10325.	10743.	188.76
10.00	9528.	9794.	10259.	188.54
10.25	8997.	9262.	9751.	188.31
10.50	8466.	8731.	9232.	188.07
10.75	7978.	8222.	8737.	187.83
11.00	7489.	7733.	8254.	187.59
11.25	7000.	7244.	7768.	187.35
11.50	6511.	6755.	7280.	187.10
11.75	6059.	6285.	6820.	186.86
12.00	5669.	5864.	6394.	186.63
12.25	5278.	5474.	5984.	186.40
12.50	4888.	5083.	5582.	186.18
12.75	4498.	4693.	5191.	185.97
13.00	4180.	4339.	4846.	185.75

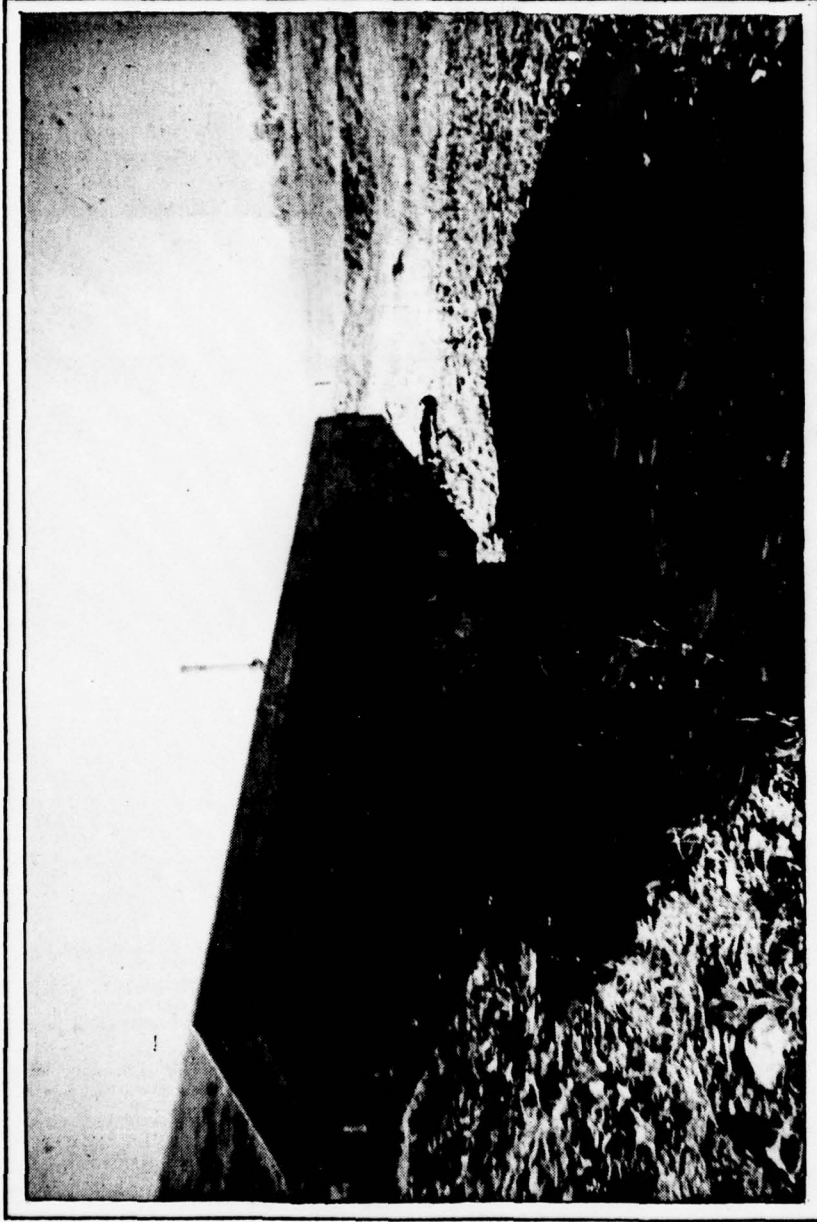
PEAK

—— Top of L

Reference-
SCS design
folder

APPENDIX

D

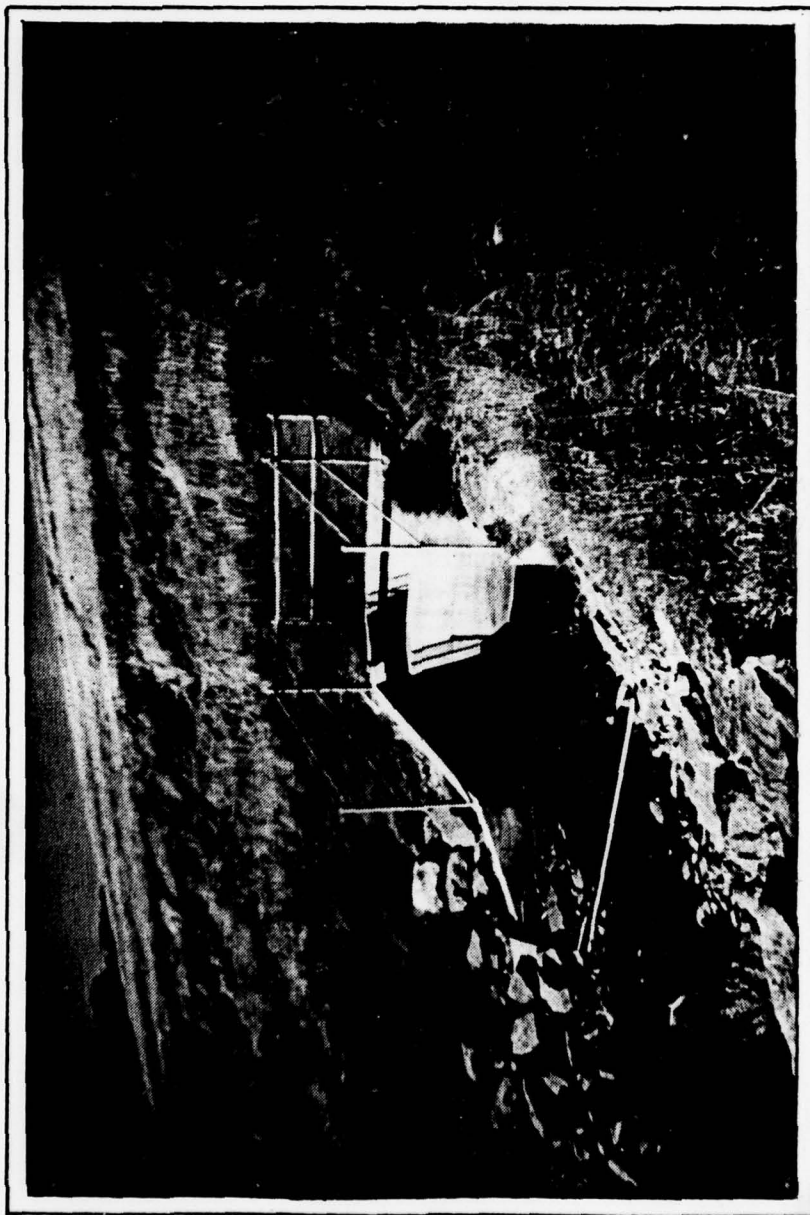


INTAKE RISER ON UPSTREAM SLOPE.

PHOTOGRAPH NO. 1

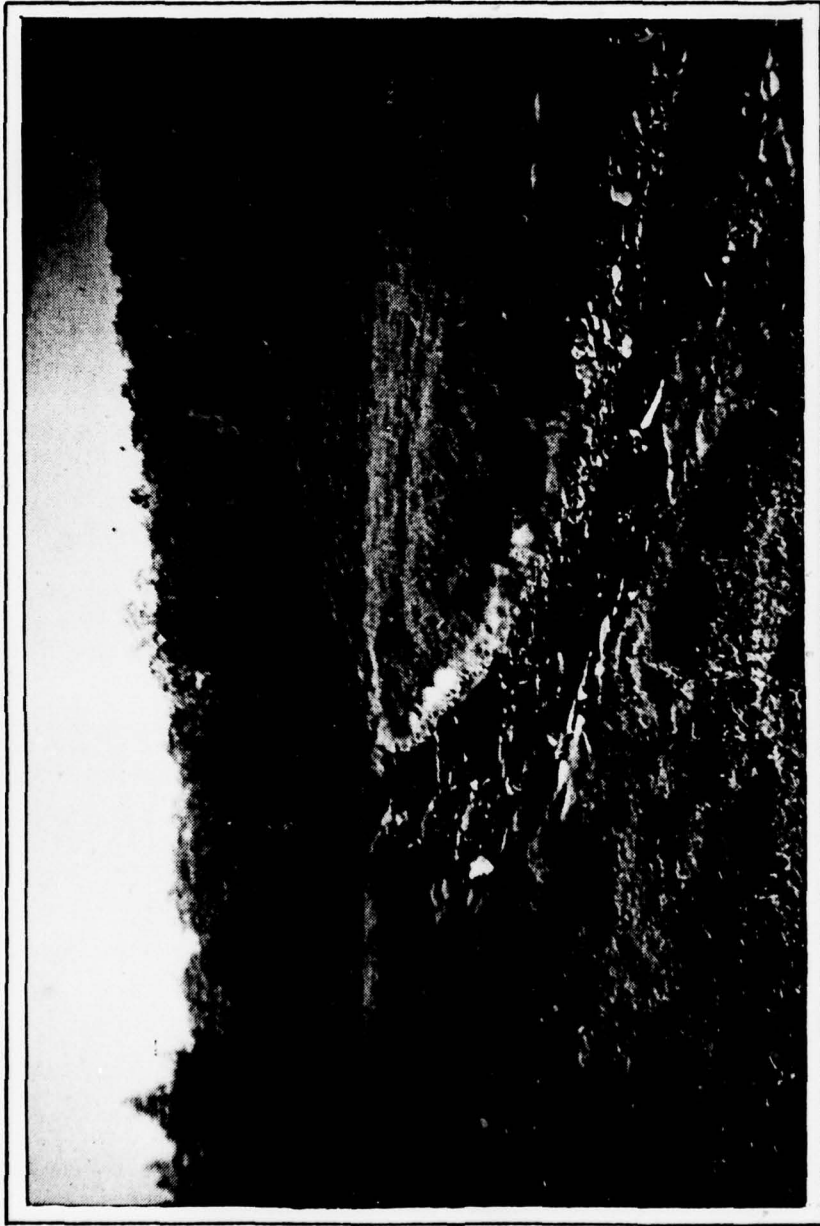


POND DRAIN INTAKE.



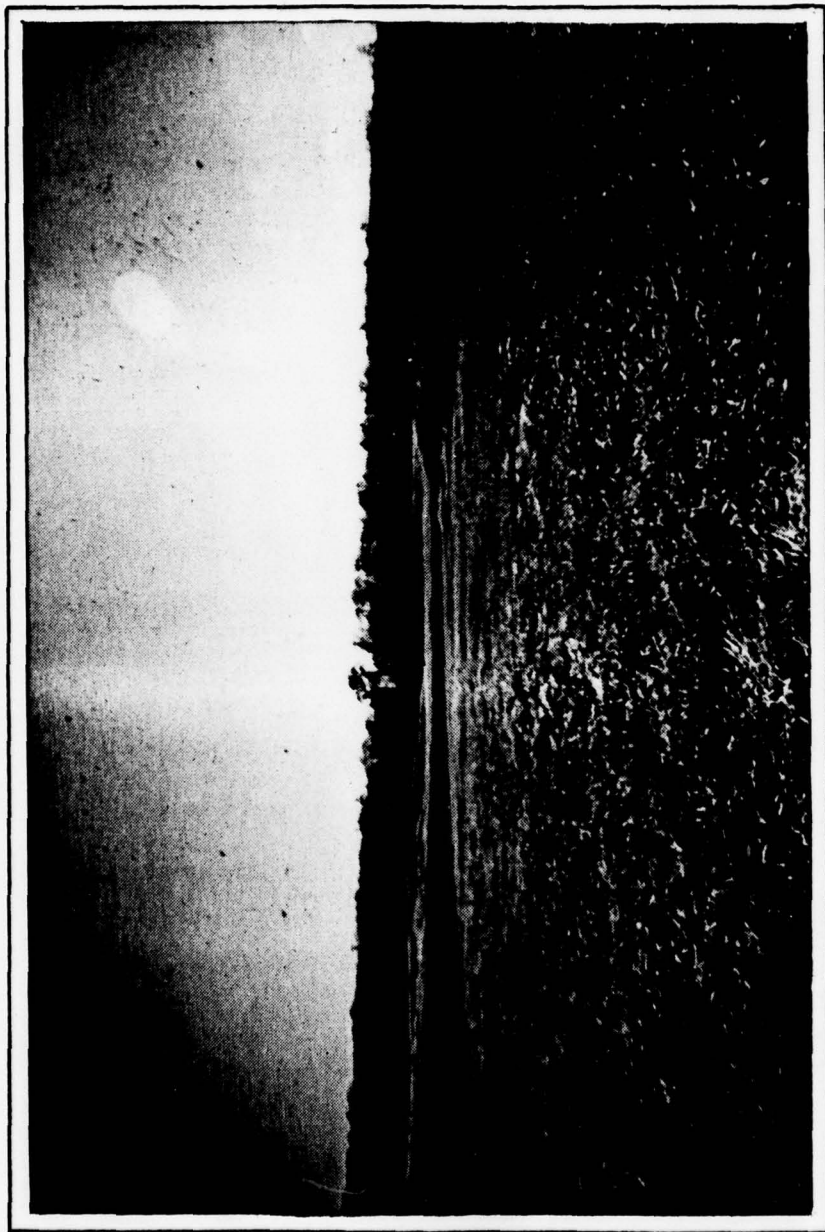
PRINCIPAL SPILLWAY OUTLET STRUCTURE
AND IMPACT BASIN.

PHOTOGRAPH NO. 3



VIEW OF PRINCIPAL SPILLWAY DISCHARGE
CHANNEL.

PHOTOGRAPH NO. 4

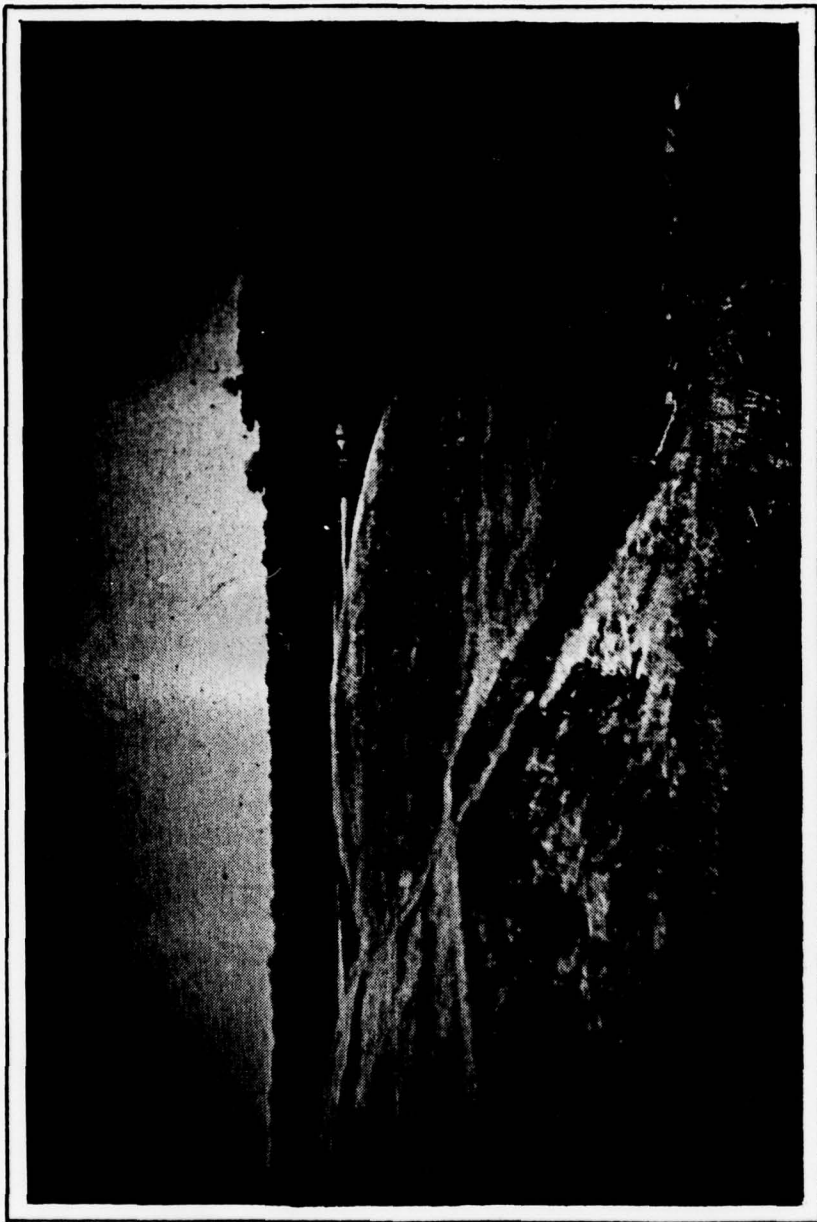


OVERVIEW OF EMERGENCY SPILLWAY LOOKING
DOWNSTREAM. NOTE GRASS COVERED BORROW
PIT ON THE LEFT SIDE OF THE CHANNEL.

PHOTOGRAPH NO. 5



OVERVIEW OF UPSTREAM SLOPE LOOKING
TOWARDS LEFT ABUTMENT.

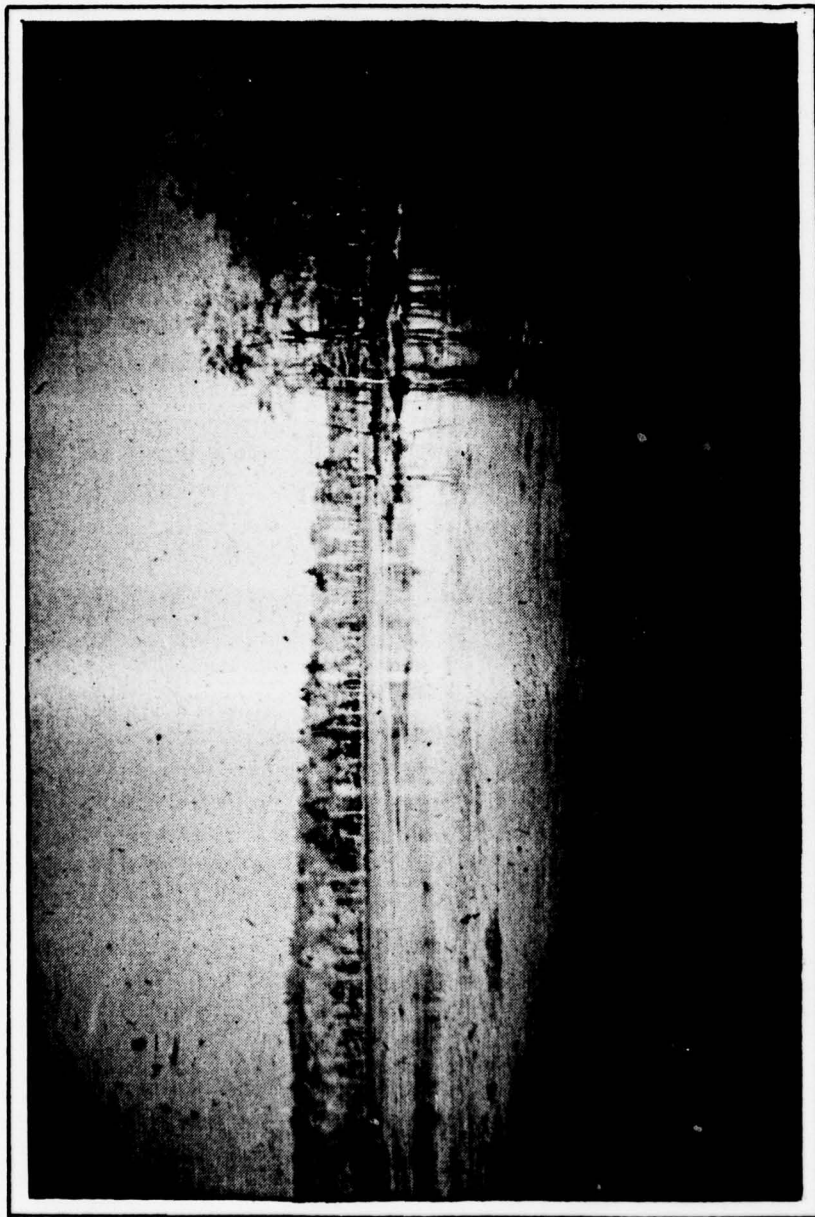


OVERVIEW OF DOWNSTREAM SLOPE LOOKING
TOWARDS LEFT ABUTMENT.



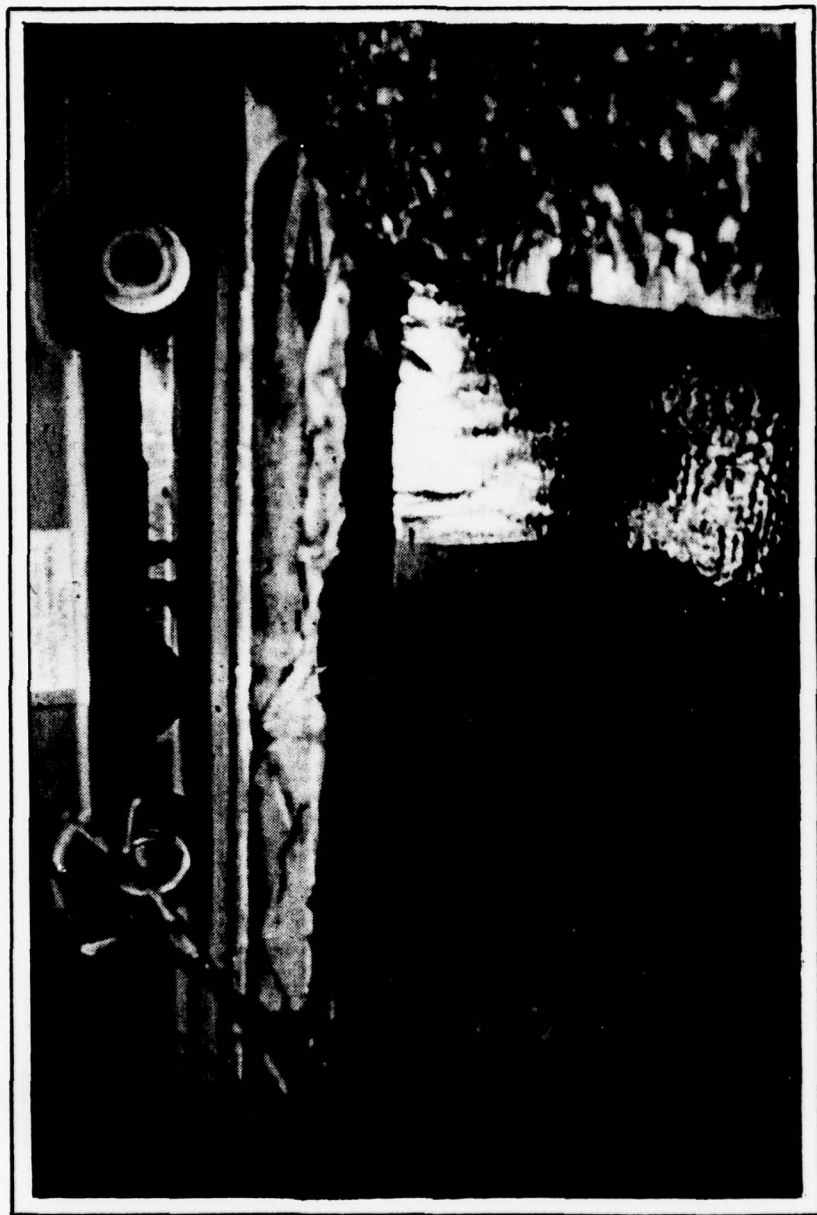
TRASH REMOVED FROM INTAKE RISER
AND PILED AROUND STRUCTURE.

PHOTOGRAPH NO. 8



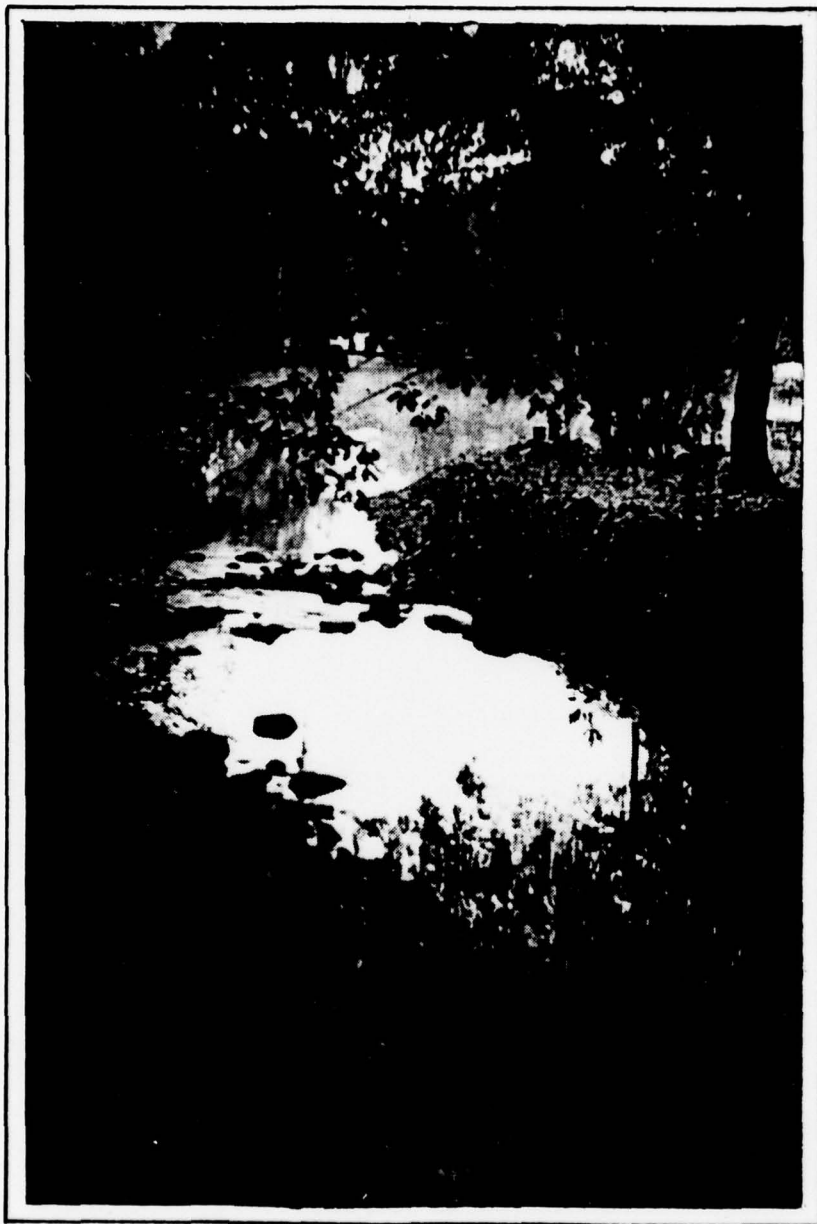
OVERVIEW OF UPSTREAM LAKE.
RANSBERRY POND

PHOTOGRAPH NO. 9



VIEW OF FIRST BRIDGE DOWNSTREAM OF DAM.

PHOTOGRAPH NO. 10

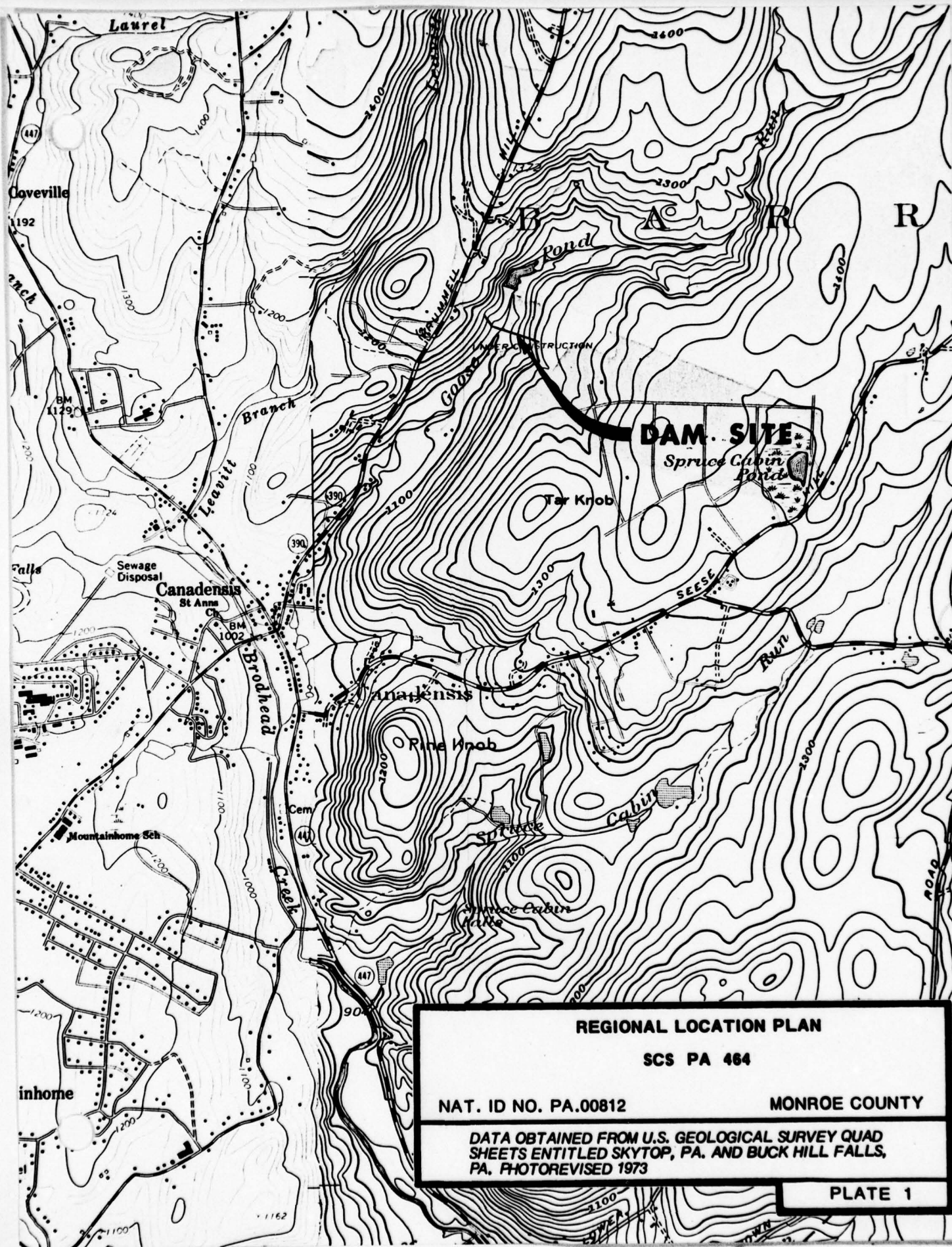


WATER COURSE BELOW DAM DISCHARGES
THROUGH SEVERAL MAN-MADE PONDS
BEFORE ENTERING THE TOWN OF
CANADENSIS.

PHOTOGRAPH NO. 11

APPENDIX

E



REGIONAL LOCATION PLAN

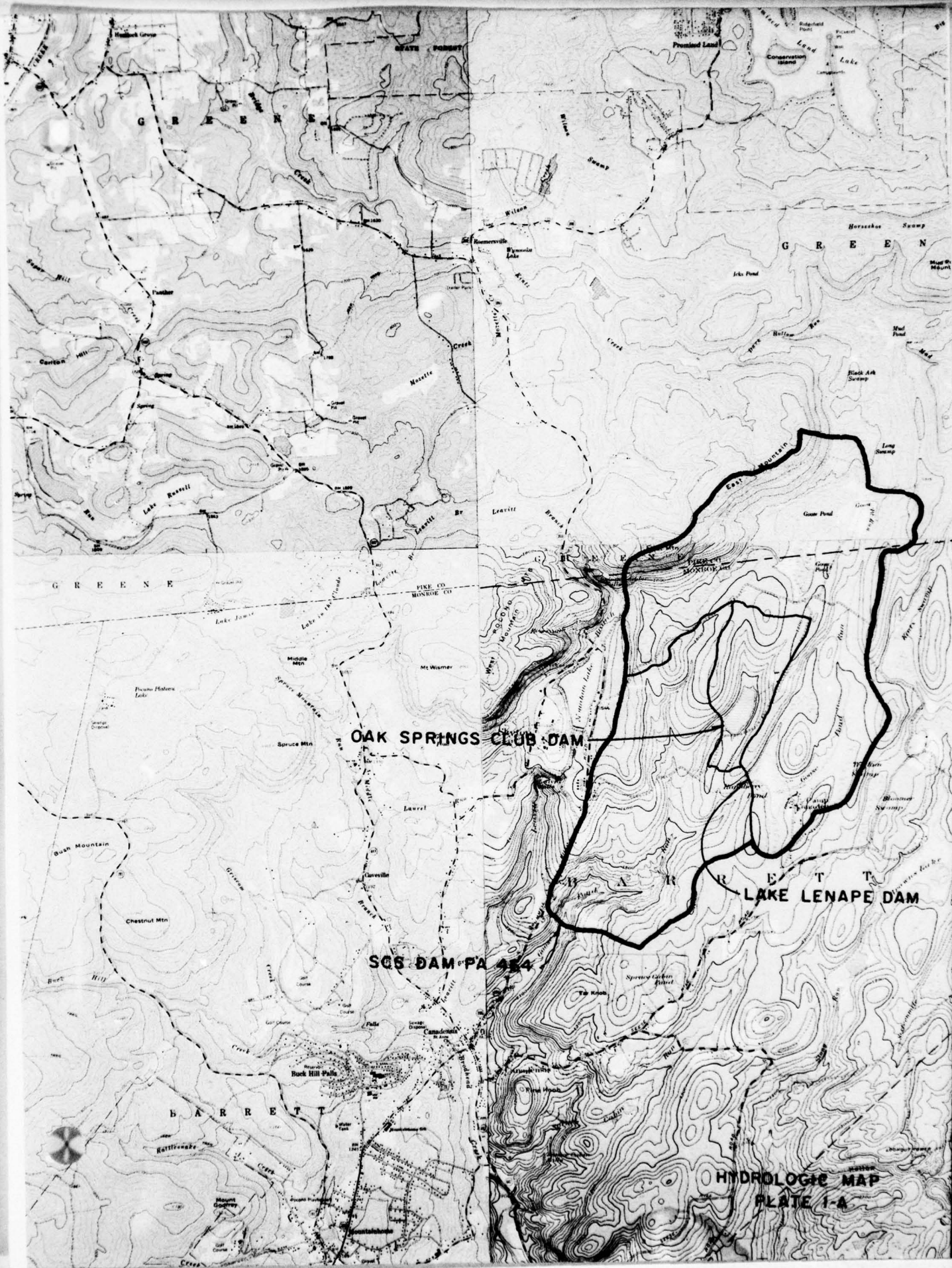
SCS PA 464

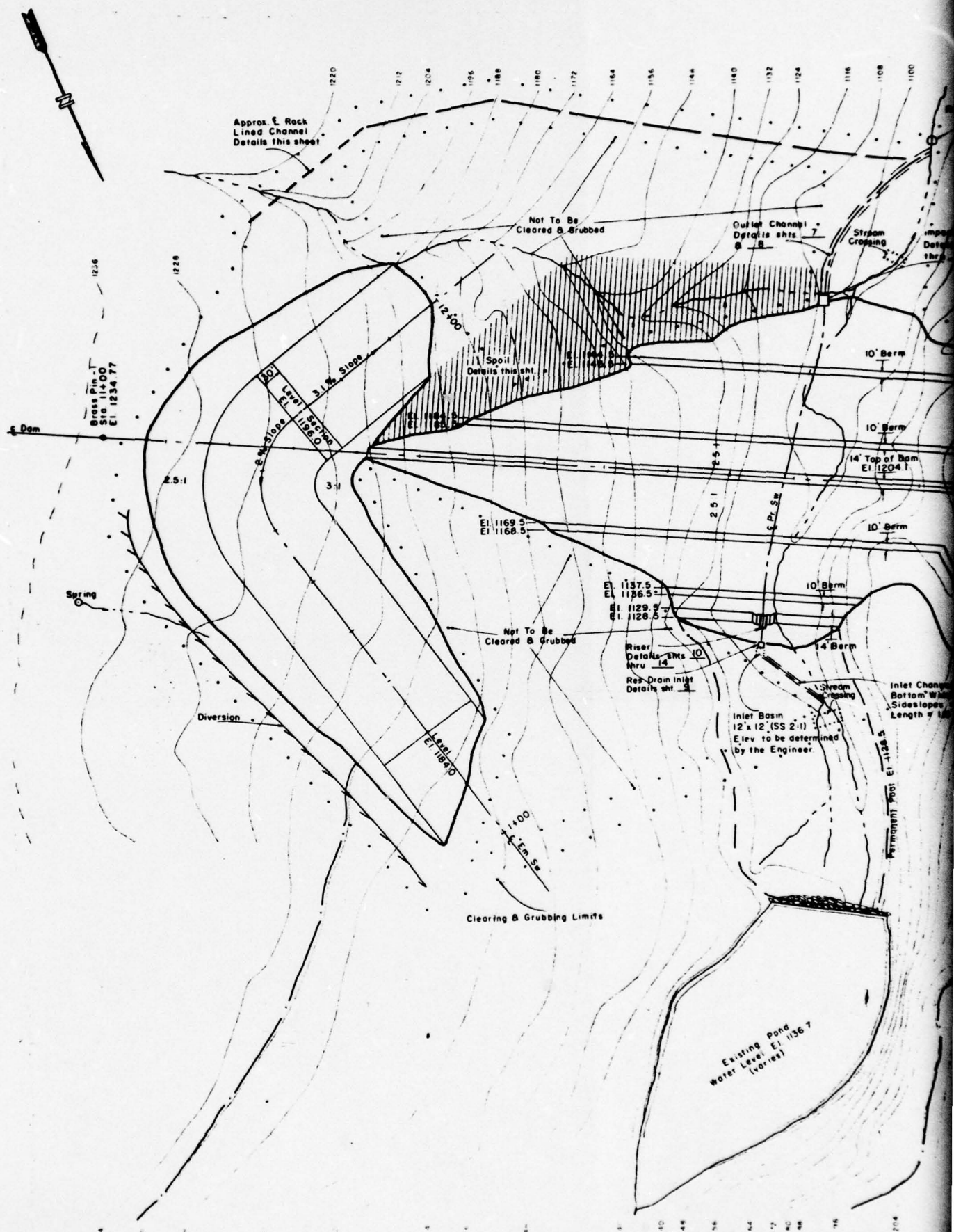
NAT. ID NO. PA.00812

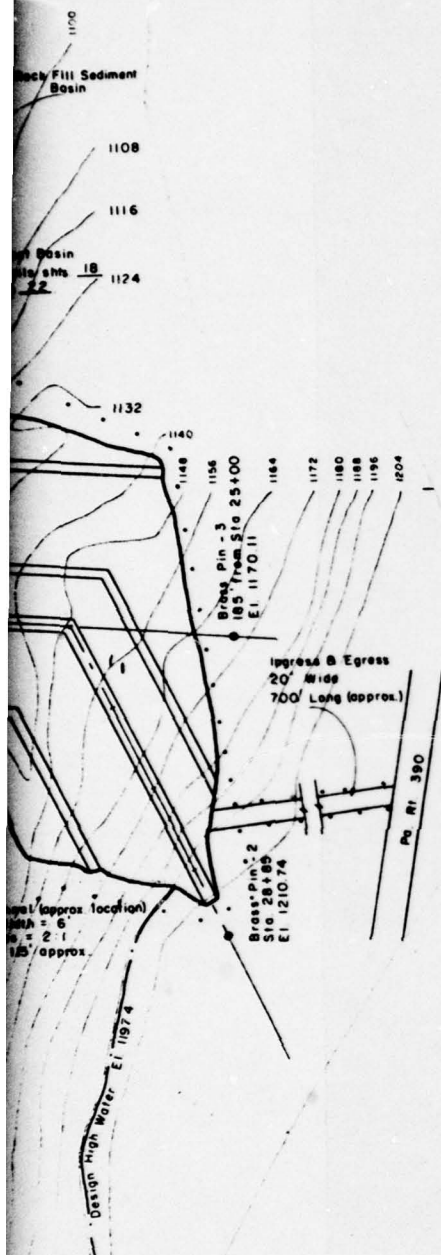
MONROE COUNTY

**DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD
SHEETS ENTITLED SKYTOP, PA. AND BUCK HILL FALLS,
PA. PHOTOREVISED 1973**

PLATE 1







PLAN OF DAM AND APPURTENANCES

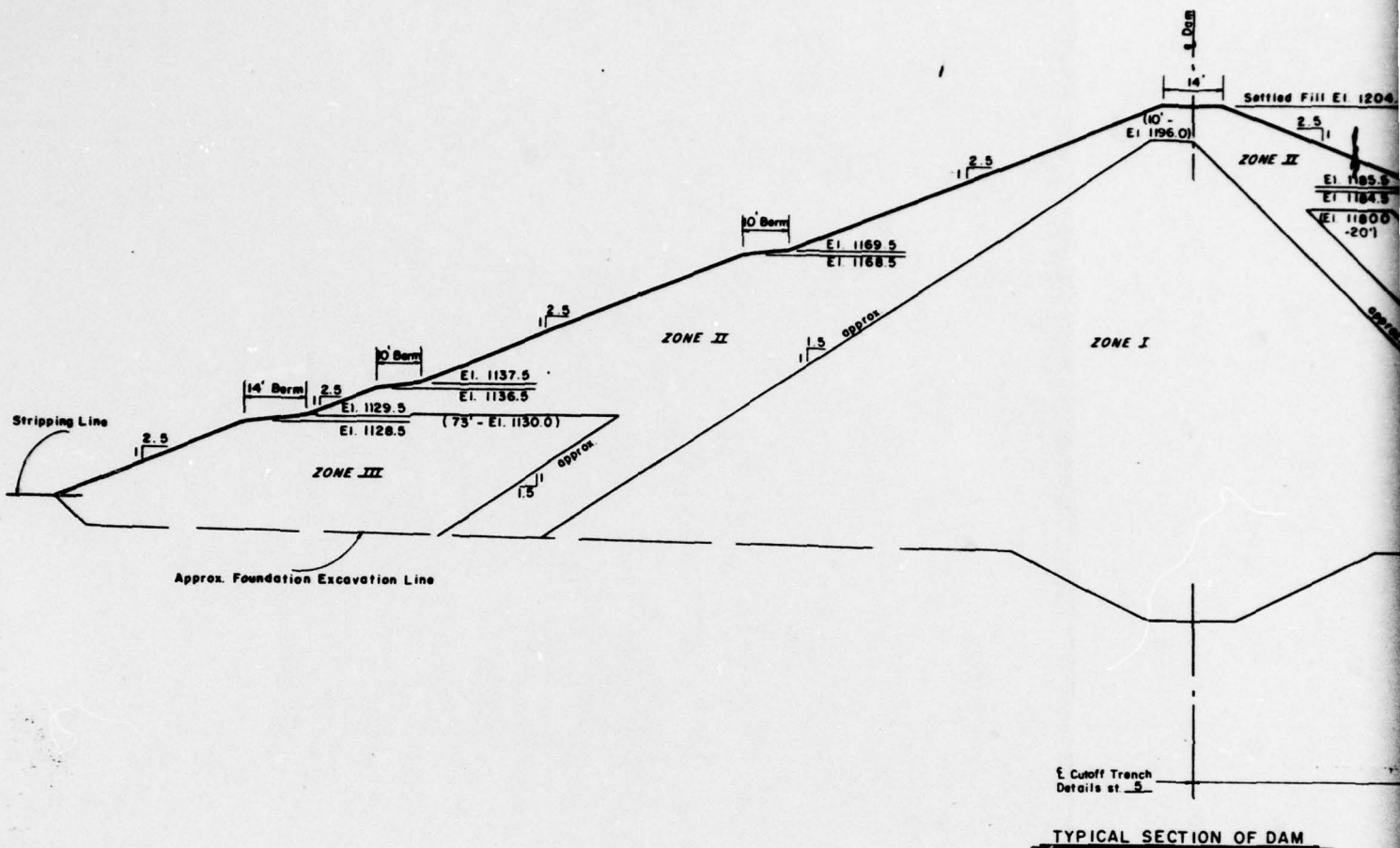
SCS PA 464

NAT. I.D. NO.PA.00812

MONROE COUNTY

**DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-464-P, SHEET
NO. 3 OF 34, DATED 5/71**

PLATE 2

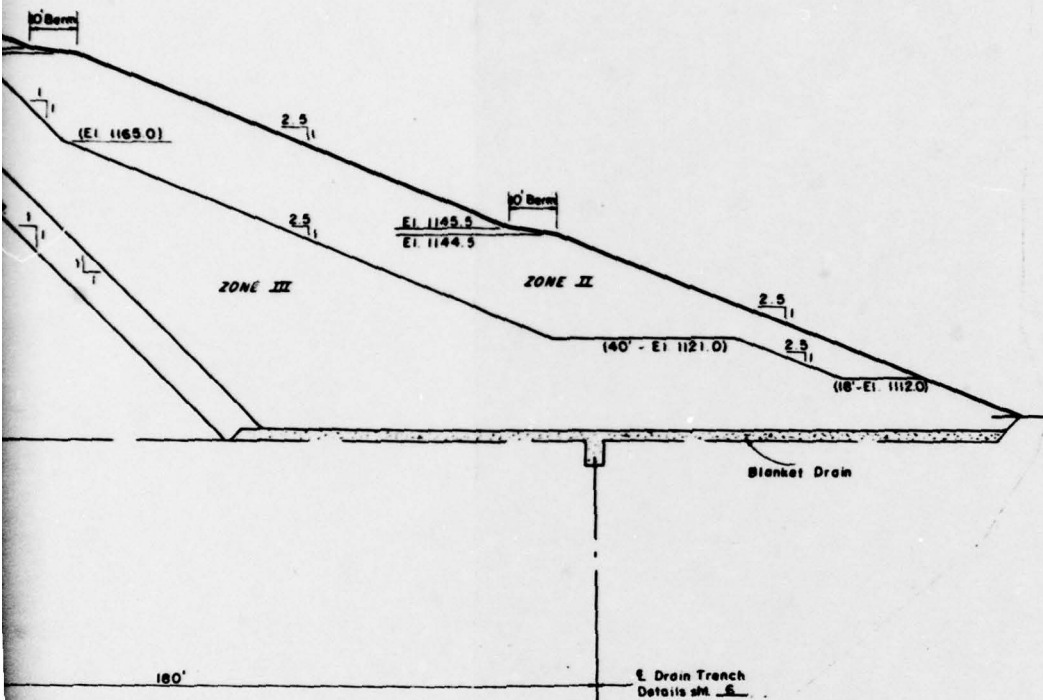


SELECTIVE PLACEMENT	MATERIAL	MAX. ROCK SIZE	MAX. LIFT ¹	REQ'D ² WATER CONTENT	COMPACTION ³	
					CLASS	DEFINITION
ZONE I	MATERIAL AS REPRESENTED BY LAB SAMPLES 71M1161, 71M1162, AND 71M1164 CLASSIFIED AS SC-SH, SH, SC-SH RESPECTIVELY.	6"	9"	OPTIMUM +	A	98% MAX DENSITY BY ASTM D698A, METHOD A.
ZONE II	MATERIAL AS REPRESENTED BY LAB SAMPLE 71M1163 CLASSIFIED AS SH	6"	9"	AS DIRECTED BY THE ENGINEER	C	COMPACT WITH MIN. SIX PASSES OF 150 PSI TAMPING ROLLER PER LIFT.
ZONE III	CONCRETE AND BULKHEAD FROM BORROW AND EXISTING SPILLWAY AREA, AND OVERLIES MATERIAL RAKED FROM ZONES I & II.	18"	24"	AS DIRECTED BY THE ENGINEER	C	COMPACT WITH MIN. SIX PASSES OF 150 PSI TAMPING ROLLER PER LIFT.

- ¹ MAXIMUM PERMISSIBLE LIFT THICKNESS BEFORE COMPACTION.
² WATER CONTENT OF FILL MATRIX AT TIME OF COMPACTION.
³ FOR TYPICAL COMPACTION CURVES, SEE SHT. 34.

CONSTRUCTION NOTES

- 1 Constructed Slopes are:
2.4:1 Upstream & Downstream
2 For constructed Fill Elevation see sh. 5



TYPICAL EMBANKMENT SECTION

SCS PA 464

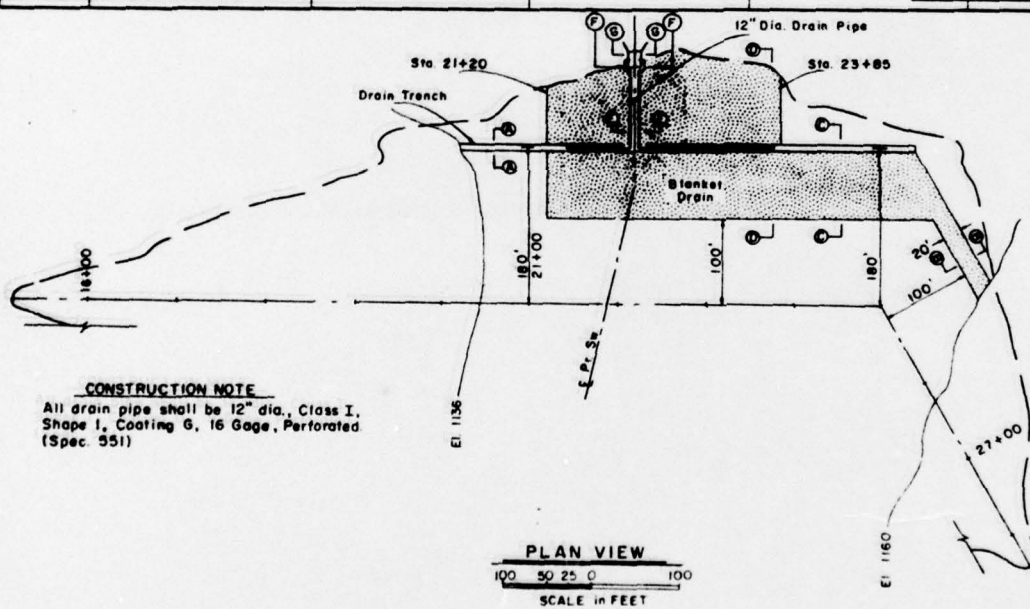
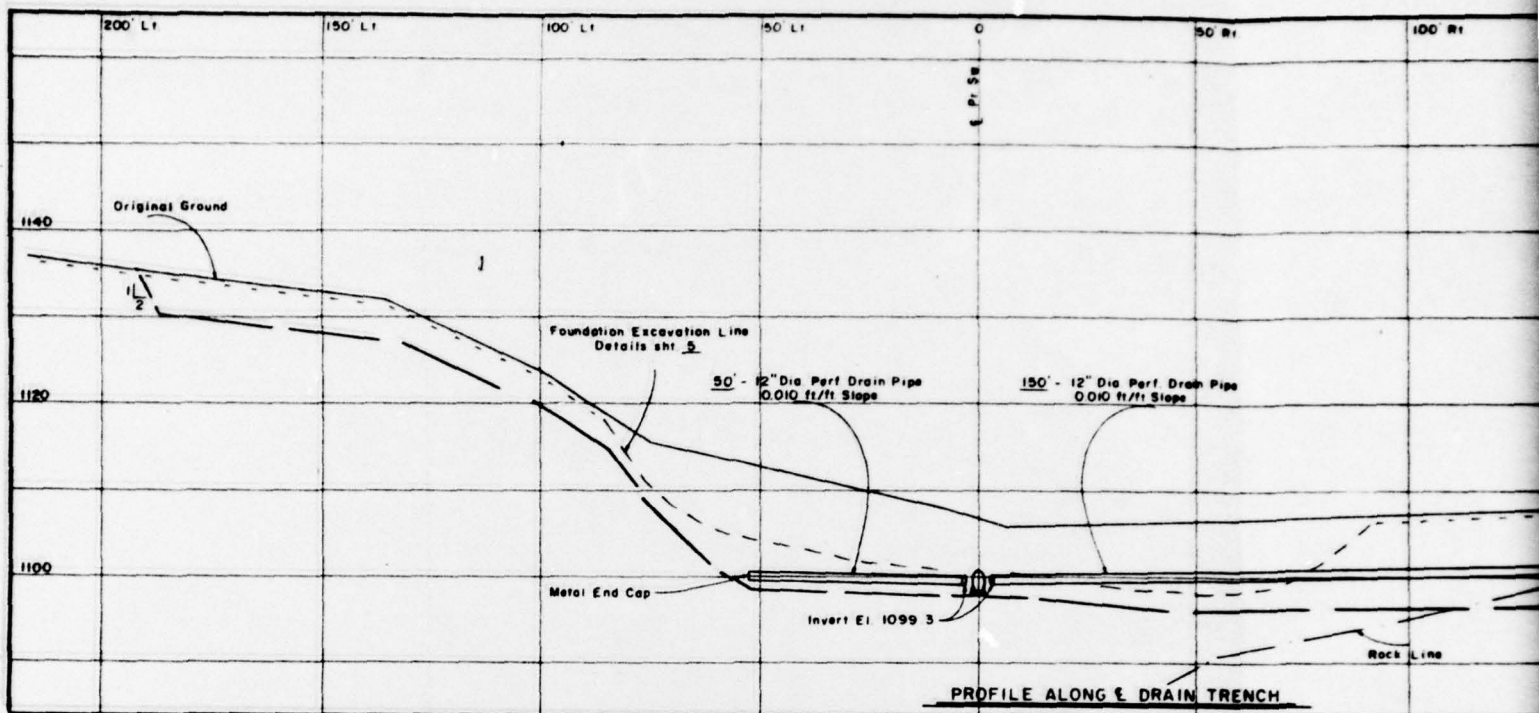
NAT. I.D. NO. PA.00812

MONROE COUNTY

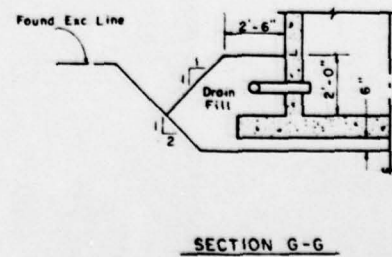
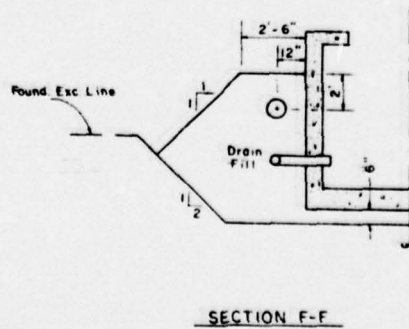
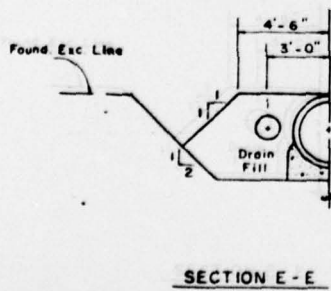
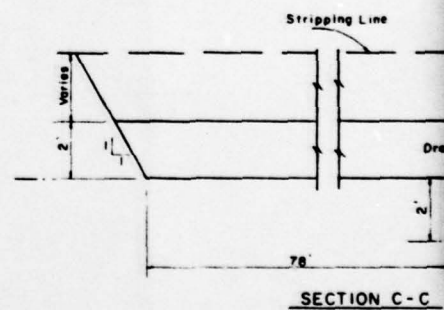
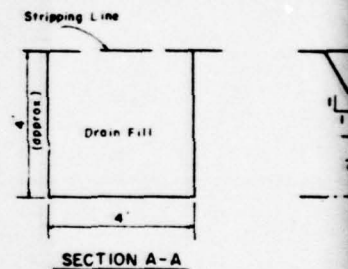
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CONSERVATION SERVICE, DRAWING NO. PA-464-P, SHEET
NO. 4 OF 34, DATED 5/71**

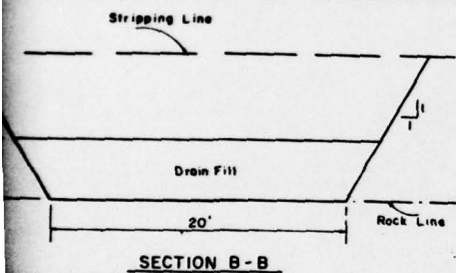
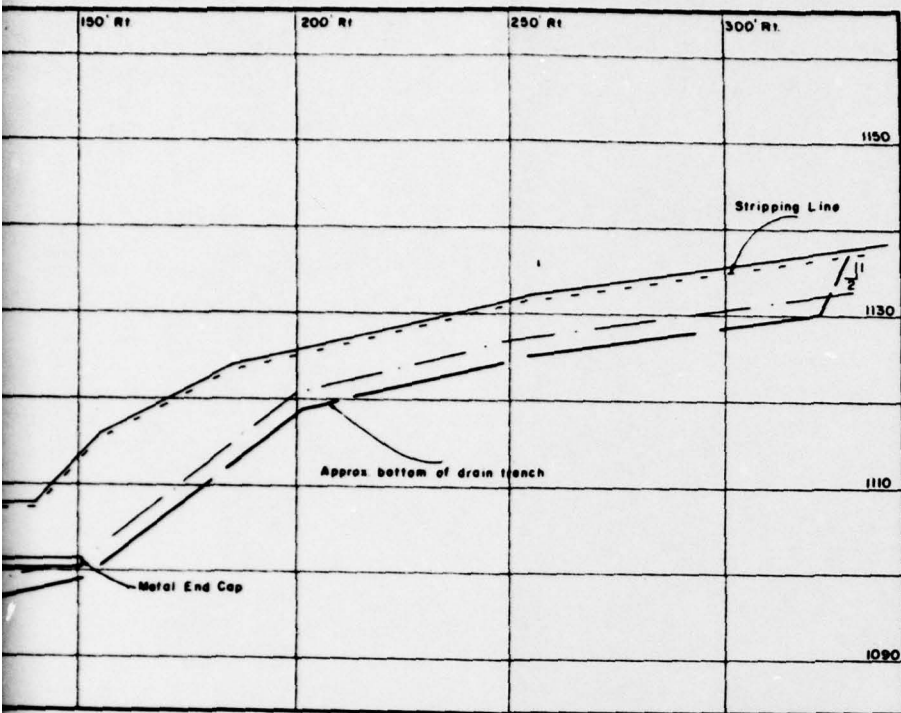
PLATE 3

2



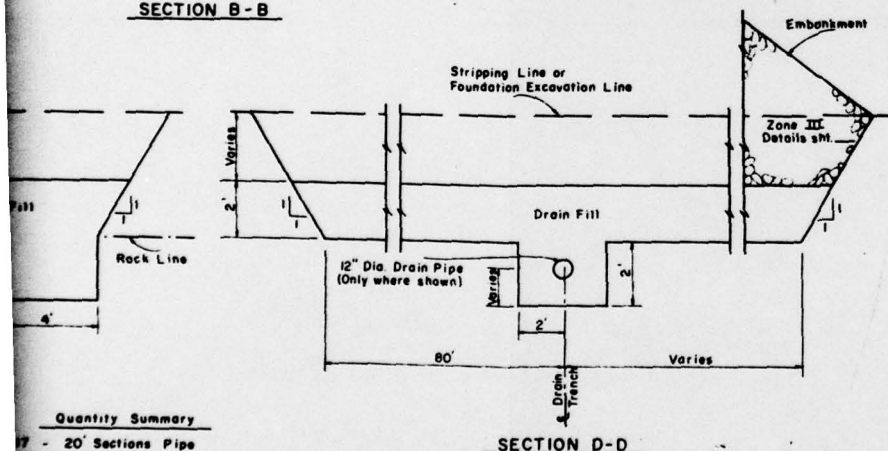
CONSTRUCTION NOTE
All drain pipe shall be 12" dia., Class I, Shape 1, Coating G, 16 Gage, Perforated (Spec. 551)





GRADATION LIMITS FOR DRAIN FILL

Sieve No	% Passing (Based on dry weight)
1-1/2"	100
1"	80 - 100
3/4"	61 - 100
1/2"	36 - 100
3/8"	20 - 80
no. 4	0 - 30
no. 8	0 - 15
no. 16	0 - 5
no. 200	< 3



Quantity Summary

- 17 - 20' Sections Pipe
- 2 - 10' Sections Pipe
- 4 - 8' Sections Pipe
- 2 - 1'-0" X 1'-0" Elbows, 90°
- 2 - 1'-0" X 2'-6" Elbows, 90°
- 2 - 1'-0" X 3'-7" Elbows, 90°
- 2 - 1'-7" X 2'-0" Elbows, 90°
- 2 - Metal End Caps
- 2 - Small Animal Guard (details shd. 23.)
- 9.33' - Total

45-247

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FEB 1971
S-7-71

EMBANKMENT DRAINAGE SYSTEM

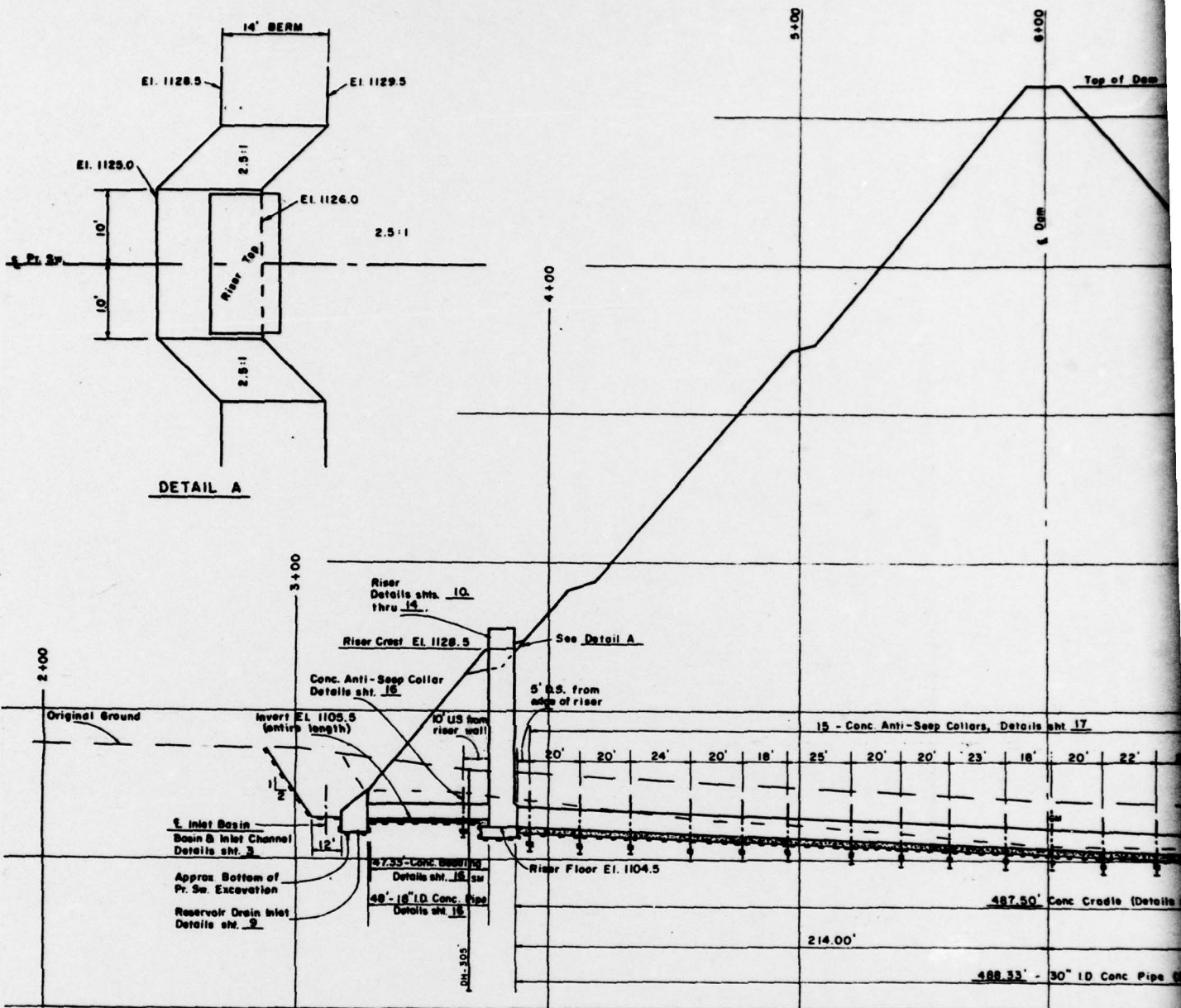
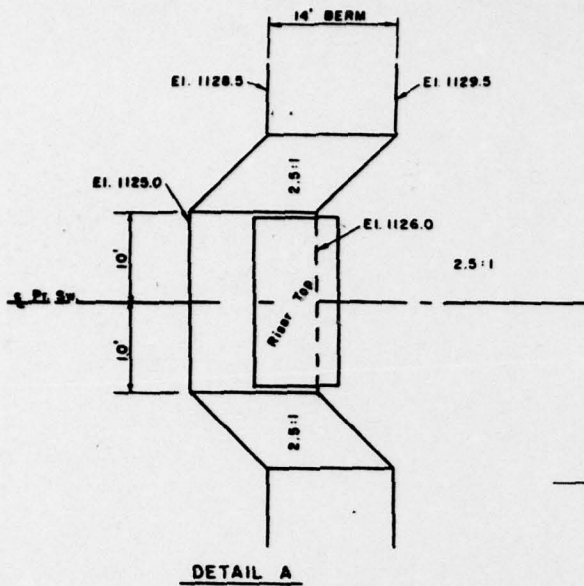
SCS PA 464

NAT. I.D. NO. PA.00812

MONROE COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA - 464-P, SHEET
NO. 6 OF 34, DATED 6/71

PLATE 4



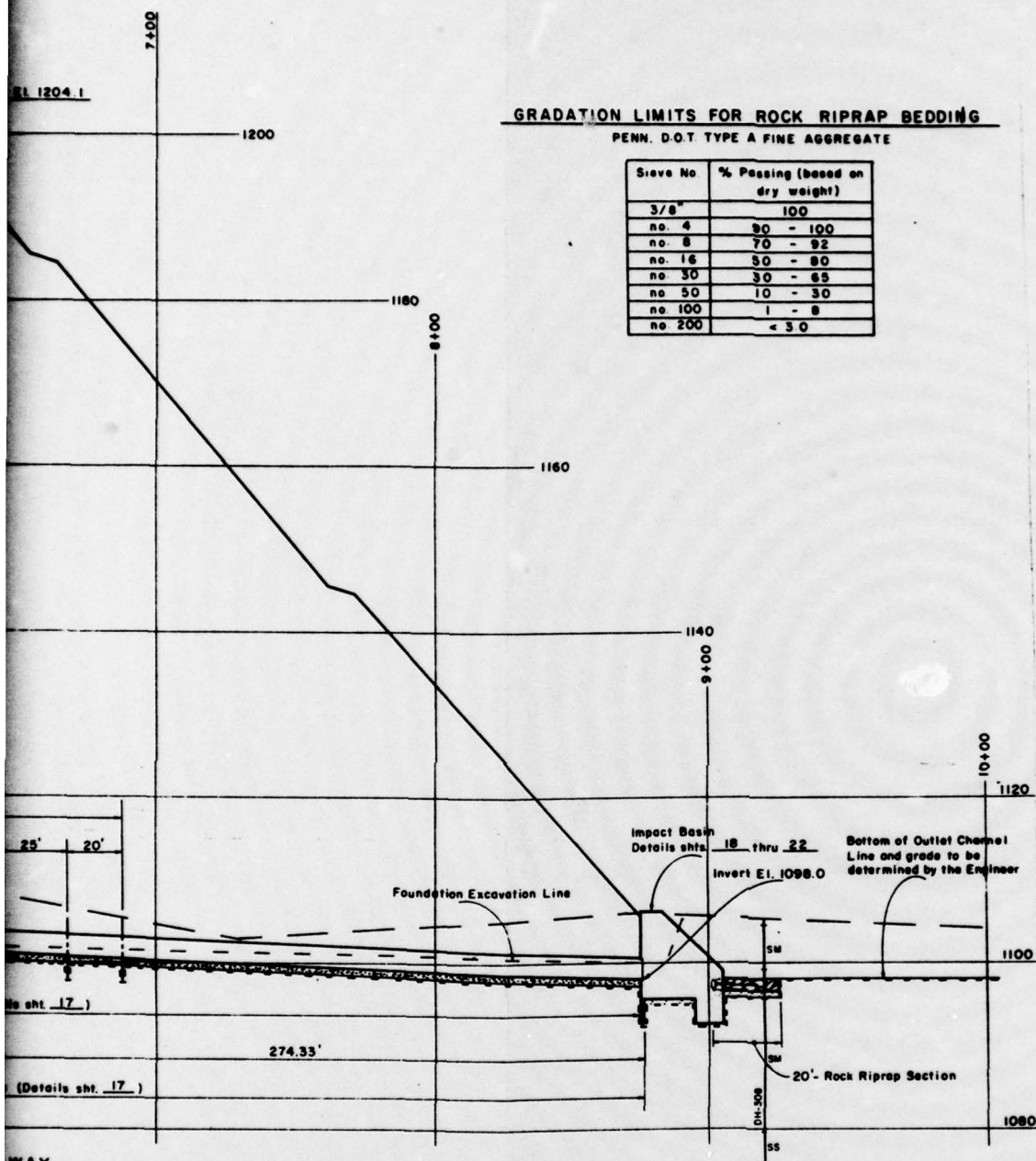
PROFILE ALONG E. PRINCIPLE SPILLWAY

EL 1204.1

GRADATION LIMITS FOR ROCK RIPRAP BEDDING

PENN. D.O.T. TYPE A FINE AGGREGATE

Sieve No	% Passing (based on dry weight)
3/8"	100
no. 4	90 - 100
no. 8	70 - 92
no. 16	50 - 80
no. 30	30 - 65
no. 50	10 - 30
no. 100	1 - 8
no. 200	< 3.0



PROFILE OF PRINCIPAL SPILLWAY

SCS PA 464

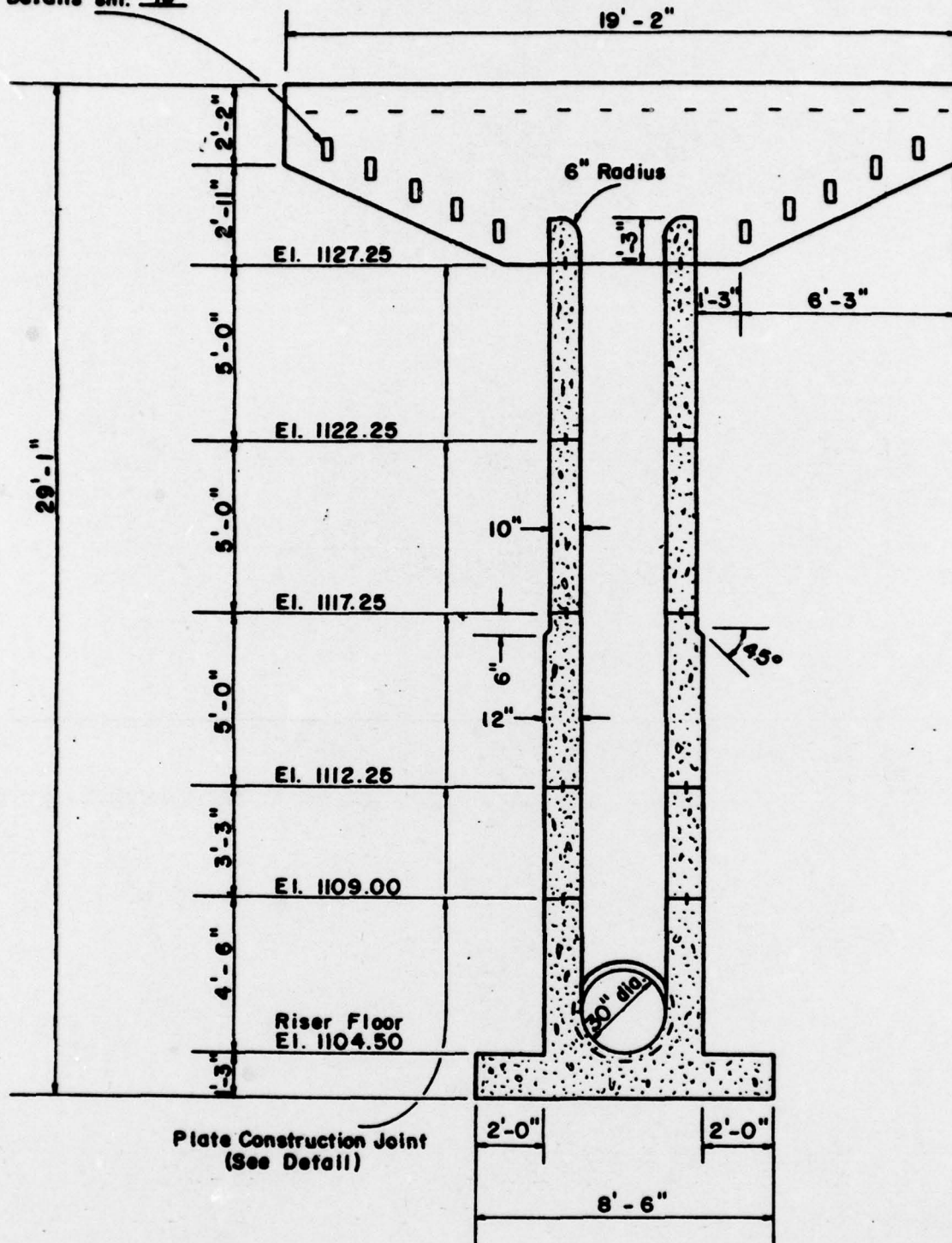
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MONROE COUNTY

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CONSERVATION SERVICE, DRAWING NO. PA-464-P, SHEET
NO. 8 OF 34, DATED 6/71

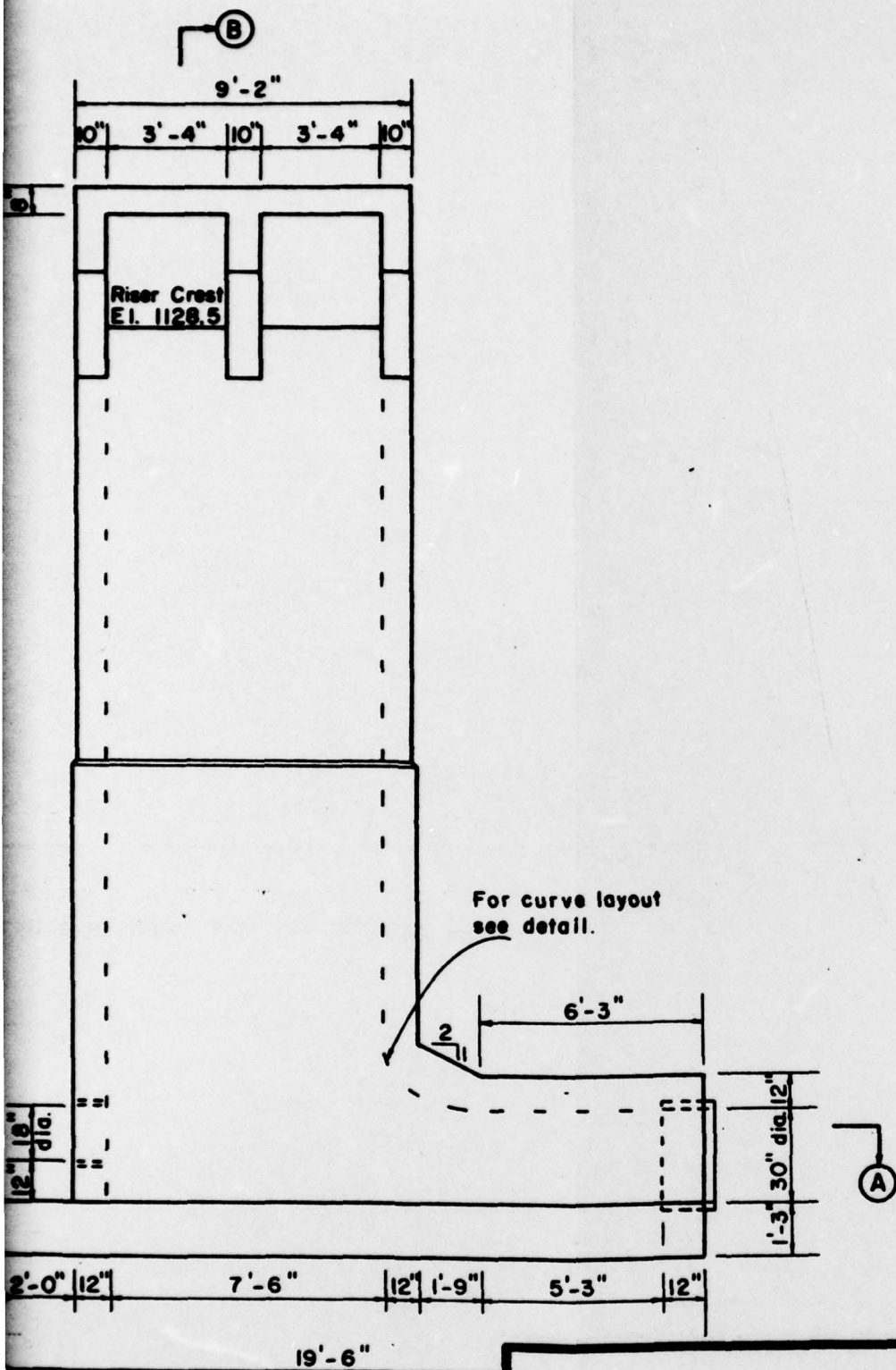
PLATE 5

Riser Trash Rack
Details sht. 15



SECTION B - B

A



SIDEWALL ELEVATION

INTAKE RISER
SCS PA 464

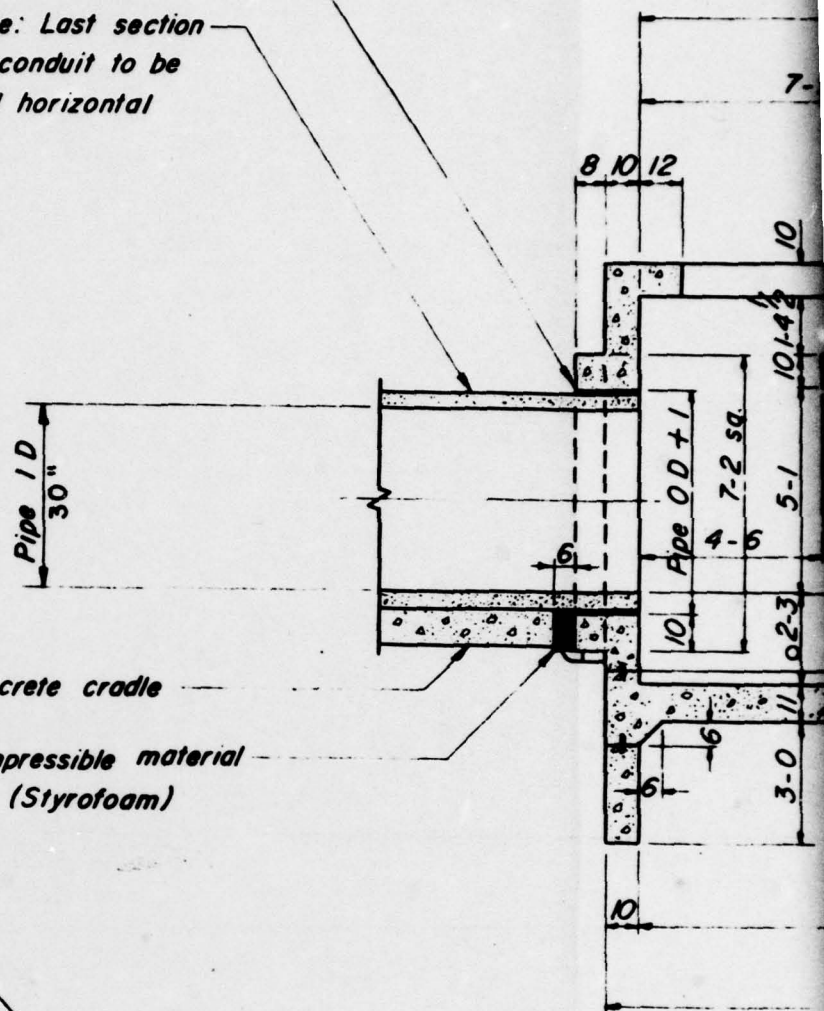
NAT. I.D. NO. PA.00812

MONROE COUNTY

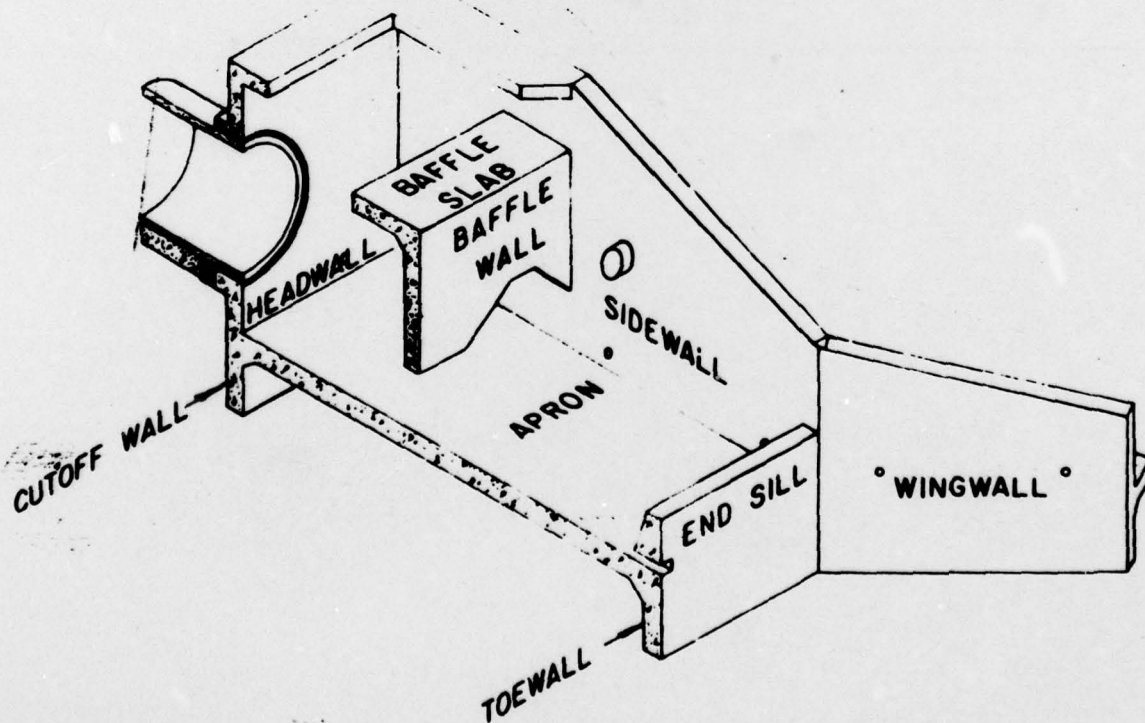
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CONSERVATION SERVICE, DRAWING NO. PA-464 - P, SHEET
NO. 10 OF 34, DATED 8/77

PLATE 6

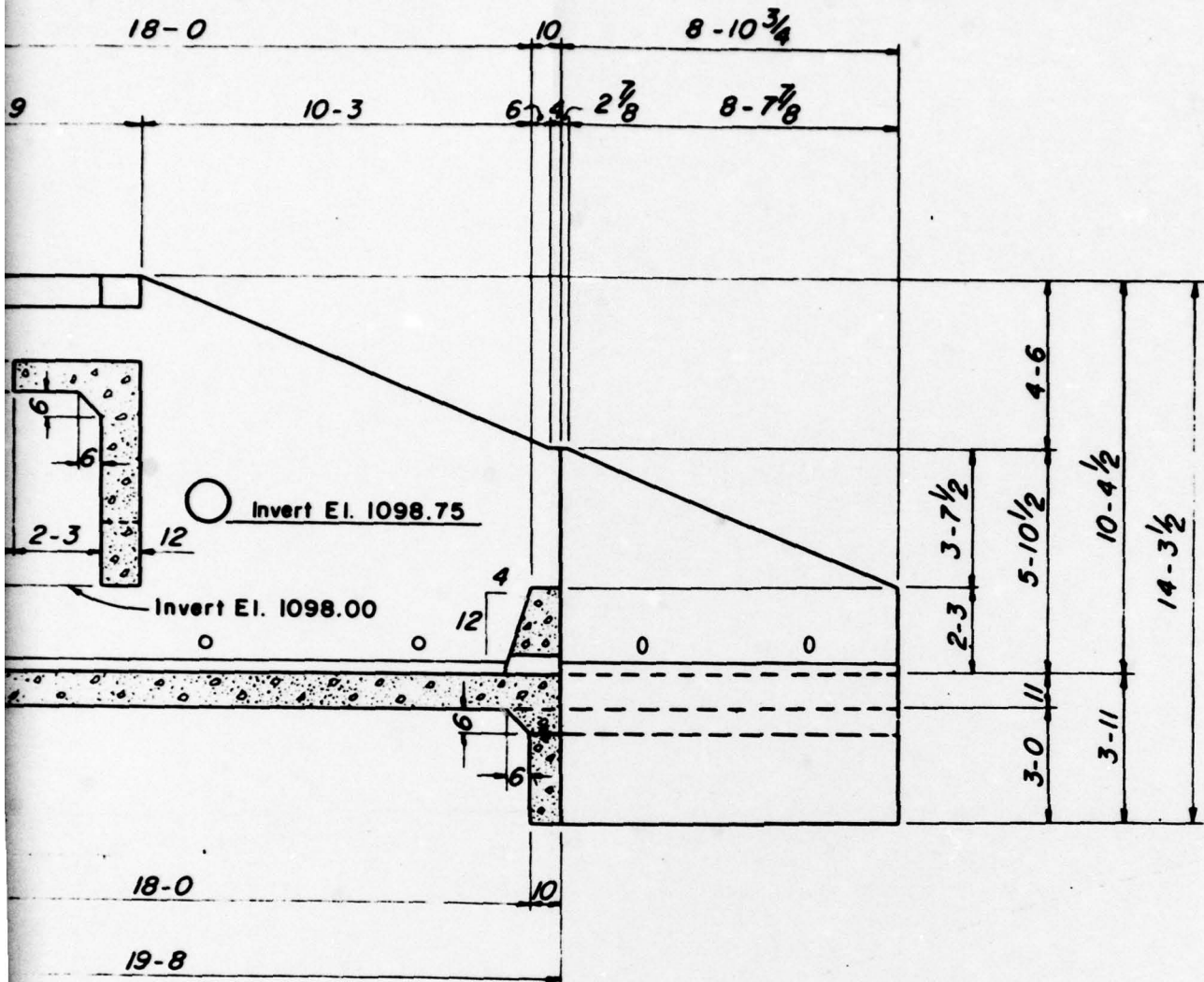
**Note: Last section
of conduit to be
laid horizontal**



SECTION



ISOMETRIC VIEW



ON CENTERLINE

IMPACT BASIN

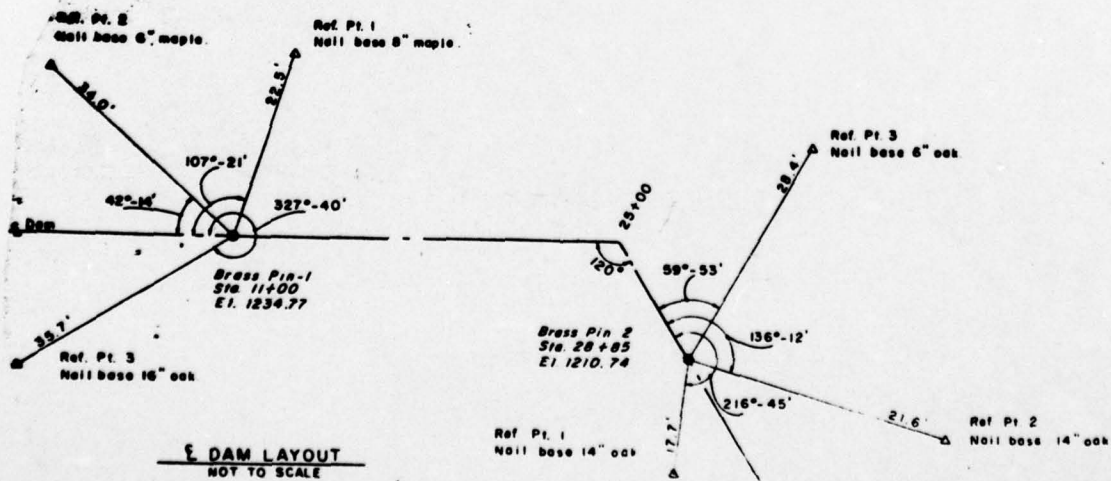
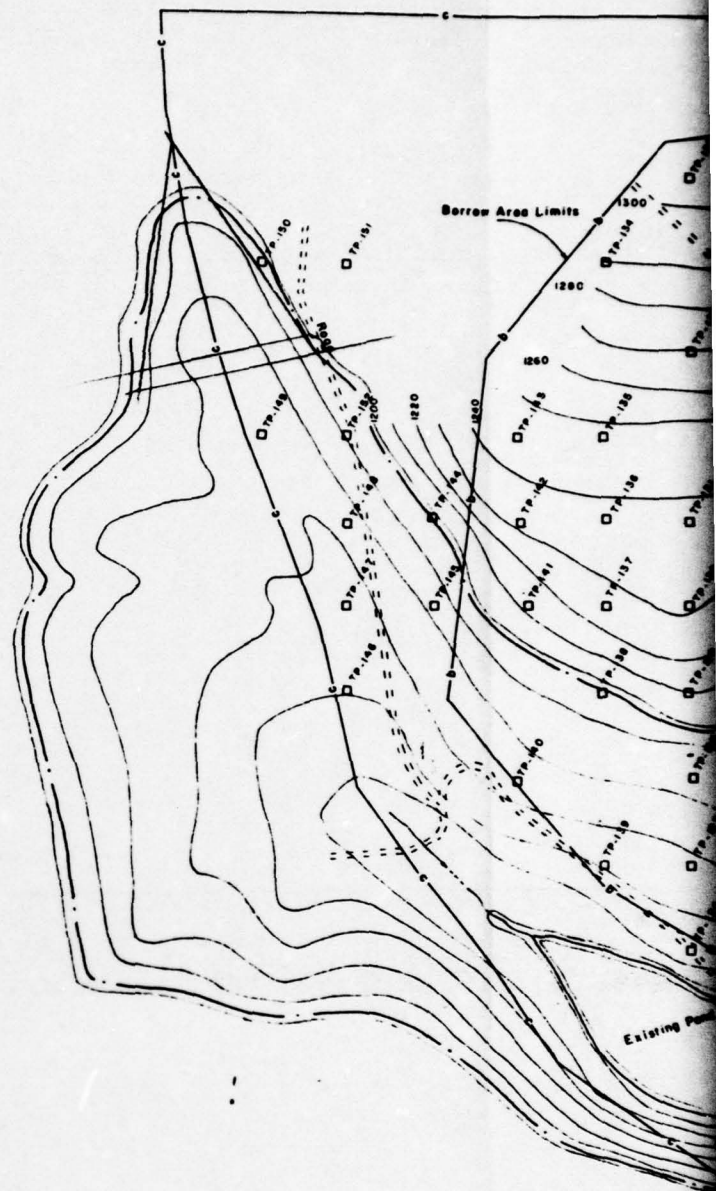
SCS PA 464

NAT. I.D. NO. PA.00812

MONROE COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA - 464-P, SHEET
NO. 18 OF 34, DATED 8/71

PLATE 7



APPENDIX

F

SITE GEOLOGY
SCS DAM PA 464

SCS Dam 464 is located in the Glaciated Low Plateaus Section (adjacent to the Pocono Plateau Section) of the Appalachian Plateaus Physiographic Province. As shown in Plate F-1, the dam site and surrounding region, as is much of northeastern Pennsylvania, is underlain by the Upper Devonian age Catskill Formation. In areas, the Catskill Formation is overlain by a mantle of Wisconsin age glacial drift.

Bedrock exposures were observed in the dam site area. During the field inspection, siltstone exposures were encountered in the left abutment area. In the right abutment area, sandstone exposures were encountered. Bedding dips at approximately 5 degrees to the north (upstream).

As reported in DER files, subsurface conditions were found to be variable in the proposed dam location. In the areas of the abutments, the rock conditions were as described above and had a cover of 3 to 40 feet of glacial drift and colluvium. The principal and emergency spillway also had a similar cover of glacial drift and alluvium. A buried Pleistocene channel was also encountered in the flood plain area. Displaced bedding was described as evidence of faulting in the left abutment.

As is typical for recent alluvial and glacial deposits, seepage potential would be an inherent characteristic. Other site conditions which would be suspect for seepage potential include the glacial drift-bedrock interface, the buried Pleistocene channel and irregular bedrock surface.

